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JOURNAL *of* EDUCATIONAL RESEARCH

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AN EVALUATION OF RESEARCH ON TEACHER PREPARATION

ALONZO F. MYERS
New York University

IT seems desirable at the beginning of this discussion to indicate rather clearly the limitations which the writer has in mind relative to the scope of the subject. One might properly consider any research study which involves such problems as child behavior, methods of teaching beginning reading, or an analysis of the difficulties of sixth-grade children in problem solving as research in teacher training, since, obviously, the results of such investigation should influence the training of teachers. It is the purpose of the writer in this discussion, however, not to consider such research, but to confine the treatment to investigations fundamental to the determination of policies and practices in the preparation of teachers; to present what he considers the outstanding present problems in the field of teacher training which should be illuminated by research studies; and to review briefly and somewhat critically, recent representative research studies.

For several years there has been an increasing recognition of the fact that teacher training urgently needs a measure of guidance and direction which it has not been receiving. No fundamental, comprehensive study of the subject has been made available since the publication of Bulletin Fourteen of the Carnegie Foundation for the Advancement of Teaching in 1917. This study, which was based on a survey of the Missouri Normal Schools, has exerted a tremendous influence upon teacher-training practices, and will continue to do so. Many new and perplexing problems have arisen since 1917, however, and in the solution of some of them the Carnegie study is not an adequate guide. It was a recognition of this need by all interested agencies that resulted in the request in 1929 for a national teacher-training survey. It is hoped that this three-year survey, which is now in its third year, will make important contributions in pointing the way to desirable redirection of effort in the field of teacher training.

Let us examine some of the problems in the field of teacher training with a view to the determination of those areas in which research is most needed. These will be considered under the following major classifications: curricula, administration, and teacher demand and supply.

I. CURRICULA

In general, it may be stated that the present practices in the determination of teacher-training curricula rest on a most insecure and unscientific basis. These practices have no validity other than in terms of past practice and personal opinion. A few outstanding leaders have made important contributions, and have substantiated their recommendations with forceful and convincing argument. Quite recently there have been attempts to provide a more scientific basis for the determination of curricula, but as yet these have not been notably successful. The following are some of the problems which await the contributions of research workers:

1. *What makes good teachers good?*—No one has yet been able to discover any significant relationship between success in teaching and any or all the elements which enter into the teacher-training curriculum. We do not even know that professional training is superior to non-professional training in the preparation of the teacher. One important difficulty in the way of the research worker is the lack of agreement as to what constitutes good teaching. Several studies, of which that by Whitney[1] was one of the first, have been made for the purpose of determining the predictive value in relation to success in teaching of such curricular elements as practice-teaching, marks in educational theory courses, and marks in academic subjects, as well as of other factors, such as intelligence and scholarship in the secondary school. Whitney found no significant relationship between any or all the factors which he considered and success in teaching.

In the opinion of the writer the lack of success in securing significantly high correlations in such studies was due largely to a constant error inherent in the method of securing measures of teaching success rather than to a real absence of correlation. If one endeavors to study this subject among teacher-training institutions which place their graduates in many school systems he must recognize the fact that the graduates with the highest ratings will be placed in the school systems which pay the highest salaries, and that those graduates with the lowest ratings will

[1] Whitney, F. L. *The Prediction of Teaching Success.* Bloomington, Illinois: The Public School Publishing Company, 1924.

be placed in the school systems which pay the lowest salaries. Almost inevitably, the superintendent or supervisory officer in whose school system the graduate with highest rating was placed will determine the rating of the teaching success of the graduate by comparison with the other teachers in the same school system. Since this school system is one which pays high salaries, the other teachers with whom this graduate is compared are, for the most part, persons who were given high ratings in the teacher-training institutions from which they graduated. Consequently this high-rating graduate will probably be rated average in teaching success, since he will be compared with other teachers who were given high ratings by the teacher-training institutions. In a similar fashion the low-ranking graduate will be placed in the school system which pays the lowest salaries and will probably be rated average in teaching success by the superintendent or other supervisory officer in that school system.

It should be evident that the use of such ratings for purposes of comparison with elements in the pre-service training is meaningless, and that correlations based on such data are necessarily low. Yet this source of error is present in recent research studies conducted for the purpose of securing predictive measures of teaching success. Obviously, this source of error can be eliminated by having one group of persons make all the ratings. This procedure would be very expensive if competent persons made the ratings and if they observed each teacher long enough to render their ratings reliable. It should also be pointed out that it is very difficult to rate teachers strictly on the basis of teaching ability and without being influenced by those factors in the teaching situation over which the teacher has no control, such as adequacy of equipment and ability of children. These difficulties, further complicated by the fact that we have no general agreement as to what constitutes good teaching, should make it readily apparent that there are challenging problems for the research worker in this field.

2. *The job-analysis technique.*—The success of the job-analysis technique in pointing the way to proper selection and training of candidates for certain skilled occupations made it apparent to certain students of teacher training that the application of this technique to teaching would make important contributions in the determination of curricula for the training of teachers. *The Commonwealth Teacher Training Study*[2] supplied a complete and thorough job analysis of teaching.

[2] Charters, W. W., and Waples, Douglas. *The Commonwealth Teacher Training Study.* Chicago: University of Chicago Press, 1929.

There are several possible points of view from which one might evaluate this study. One is, did it accomplish its purpose? It undoubtedly accomplished its immediate objective, which was to make a thorough analysis of the activities in which teachers engage. Another point of view from which it may be considered is, did it make an important contribution to the constructive revision of teacher-training curricula? On this point there would not be unanimity of opinion. Many people are keenly disappointed, because the study does not point clearly the way to curricular revision. Perhaps too much was expected. Certainly some groups endeavored to utilize the results of this study in ways in which it could not reasonably be expected to be serviceable. An example of this use is furnished by one state in which all instructors in the state teachers' colleges were required to check all of their courses (academic, professional, and training) against the list of 1001 activities, reporting for each course the number of these activities considered, and the depth to which each activity was treated. This made possible a determination of the contribution of each course to the instruction of students in the performance of the activities listed in *The Commonwealth Teacher Training Study*. Clearly the Commonwealth Study was never intended to serve as a measure of the value of academic courses.

The preceding example of the uses which have been made of this investigation should illustrate very well the limitations in the usefulness of the study. It must be recognized that even though we know all of the activities in which teachers engage, we cannot construct a teacher-training curriculum on the basis of this information alone. We must recognize that the training of teachers is not comparable with the training of bricklayers or of street car motormen. The kind and extent of the differences measure the limitations of *The Commonwealth Teacher Training Study* and of the job-analysis technique in the determination of teacher-training curricula. Among other important considerations, it omits entirely the fact that the teacher should be educated as well as trained, a consideration which has been overlooked too frequently in the construction of teacher-training curricula.

It should be pointed out, however, that *The Commonwealth Teacher Training Study* has an important contribution to make in two directions: (1) in pointing the way to a reorganization of certain education courses which are concerned primarily with teaching technique and class management; and (2) in enabling those responsible for the organization of observation and practice-teaching courses to check against this compre-

hensive list of teacher activities those activities which are made a part of the experiences of student-teachers and observers in the laboratory school. Such use of the study would result in broadening the conception of the experiences and activities to be included in the laboratory school program, and would lead inevitably to increasing the time devoted to the laboratory-school aspects of the training of the teacher in most of the teachers colleges.

An excellent example of the use of the technique of activitiy analysis in the determination of materials to be included in teacher-training curricula is contained in Dr. Stratemeyer's[3] study, *The Effective Use of Curriculum Materials*. Dr. Stratemeyer studied teacher activities in the use of curriculum materials in the elementary school, and desirable teacher activities as indicated by teacher judgment and expert opinion, to the end that she might formulate desirable units relating to the elementary-school curriculum to be included in the professional preparation of elementary teachers. More studies of this type are needed.

3. *How much and what kind of laboratory school experiences are essential in the professional preparation of teachers?*—There is no aspect of teacher training in which there is greater need for careful research and constructive leadership than in the laboratory-school aspects of teacher preparation. There are few if any aspects of teacher-training curricula in which there are greater variations in practice. In the matter of allotment of credit alone the variation is tremendous. According to Class,[4] "the range of credit hours devoted to practice teaching and observation in the two-year courses is from 3 to 19." In liberal-arts colleges which train teachers, according to Baugher,[5] the length of time over which the practice-teaching course extends ranges from no weeks to 54 weeks, and among those which expressed the range in hours from no hours to 180 hours. The range of semester hours of credit is from none to eleven. Variation is equally great with reference to the conditions under which

[3] Stratemeyer, Florence. *The Effective Use of Curriculum Materials*. Contributions to Education, No. 460. New York: Bureau of Publications, Teachers College, Columbia University, 1931.

[4] Class, Edward C. *Prescription and Election in Elementary School Teacher-Training Curricula in State Teachers Colleges*. Contributions to Education, No. 480. New York: Bureau of Publications, Teachers College, Columbia University, 1931.

[5] Baugher, Jacob I. *Organization and Administration of Practice-Teaching in Privately Endowed Colleges of Liberal Arts*. Contributions to Education, No. 487. New York: Bureau of Publications, Teachers College, Columbia University, 1931.

laboratory school work is conducted. Research is needed relative to such questions as the following:

(1) What activities should be included in the laboratory school experiences of the student?

(2) What are the respective contributions of observation and practice in the practical training of the teacher, and to what extent can the former safely be employed as a substitute for the latter?

(3) Which is to be preferred, concentrated or extended periods of practice?

(4) How much time should be devoted to observation and practice in curricula of two years, three years, four years, and five years, in length for the preparation of elementary teachers and of secondary teachers?

Unfortunately, the determination of the amount and kind of laboratory-school experiences which should be provided involves more than a curricular problem. It involves serious administrative and financial problems as well. A teachers-college president gave expression to one aspect of the problem at the meeting of the American Association of Teachers Colleges in Detroit in February, 1931, when he said substantially this: "Until there is more evidence than is available at present to prove that 90 hours of practice-teaching (the minimum amount required by the standards of the American Association of Teachers Colleges) is superior to one-half that amount in the training of the teacher, I shall be unwilling to request the appropriation of the additional $250,000 which would be necessary to provide 45 additional hours of practice-teaching per student."

Another aspect of the problem was expressed to the writer by a teachers-college president. He stated that with limited funds available for the operation of his teachers college he could not continue to satisfy the minimum requirements of the American Association of Teachers Colleges relative to practice teaching and at the same time satisfy all of the requirements of the North Central Association of Colleges and Secondary Schools. Since recognition by the American Association of Teachers Colleges was not a vital factor to the continued prosperity of his institution, and since recognition by the North Central Association was "a life and death matter," he would choose to ignore the standard of the American Association of Teachers Colleges with reference to practice teaching. In that connection, a valuable research project would be the determination of the extent to which the Southern Association and

the North Central Association have influenced the curricular policies of teachers colleges located in the areas served by these associations during the last decade.

II. ADMINISTRATION

Administrative problems in the field of teacher training have become increasingly difficult during the past few years. During this period the teachers colleges have come into direct competition with the liberal-arts colleges in the matter of the preparation of high-school teachers. There has been a marked tendency for the teachers colleges to provide new types of instructional offerings and service, frequently without adequate additional financial support for the expanded program. Quite recently, with the accumulation of a surplus of teachers in all sections of the country, there has been a tendency to demand that teacher-training institutions select more carefully among the candidates for admission, restrict their output in the light of the demand, and train specifically for those fields for which a demand exists. Closely related to this trend there is a tendency to insist that state teacher-training institutions coördinate their efforts, eliminate needless duplication of effort, and operate as service agencies to the public schools of the state rather than as independent agencies developing along the lines of institutional ambition.

The following are some of the administrative problems in the field of teacher training on which further research is needed.

1. *Boards of Control.*—There is no uniformity of practice or of opinion relative to the agency or agencies which should be entrusted with the control of state teacher-training institutions. In some states each teachers college has a separate board of trustees. Frequently the membership is largely local. In some states a single board controls the teachers colleges. In others one board controls all state-supported institutions of higher education. In some of the states the state board of education serves as the board of control for the teacher-training institutions, and the state commissioner of education, as the chief executive officer of the state board of education, coördinates the work of the several teacher-training institutions of the state, much as the president of a university coördinates the efforts of the several schools of the university. In some of the states an officer, commonly known as the state director of teacher preparation, devotes full time to this function under the direction of the commissioner. In contrast with this situation, in many of the states the chief executive officer of the state department of public instruction has little or no responsibility for the teachers colleges.

Rutledge[6] endeavored to validate certain guiding principles in the administration of teachers colleges and normal schools, utilizing for validation three groups of competent judges. Group I consisted of professors of public school administration and state commissioners of education. Group II consisted of professors of normal-school education and state directors of teacher preparation. Group III consisted of presidents of teachers colleges and normal schools. With reference to certain of the principles which relate to the foregoing discussion, it is interesting to compare the judgments of each of the three groups of judges. The reader should keep in mind the composition of each group.

Principle II. All state-supported institutions having for their chief purpose the preparation of public-school teachers should be under a single unifying state board of control.

	Percent Voting Yes
Group I	91
Group II	100
Group III	80

Principle III. The chief executive officer of the state department of education should be responsible for the administration of the policies adopted by the board of control of the teachers colleges or the normal schools.

	Percent Voting Yes
Group I	91
Group II	75
Group III	53

Principle III-A. An important duty of the chief executive officer of the state department of education should be the nomination of the presidents of the teachers colleges and normal schools within the state.

	Percent Voting Yes
Group I	100
Group II	88
Group III	50

Principle III-C. The chief executive officer of the state department of education should assist the presidents of the teachers colleges or the normal schools in determining the services each institution should render the state in the preparation of teachers.

[6] Rutledge, Samuel A. *The Development of Guiding Principles for the Administration of Teachers Colleges and Normal Schools.* Contributions to Education No. 449. New York: Bureau of Publications, Teachers College, Columbia University, 1930.

	Percent Voting Yes
Group I	100
Group II	88
Group III	79

Additional research is needed for the purpose of determining the effectiveness of centralized control of the teachers colleges of a state as opposed to separate control for each teachers college. An obvious difficulty is that of determining satisfactory measures of effectiveness. It is suggested that the most important criterion should be the extent to which the needs of the state for trained teachers are being met.

In some of the states which have centralized the control of state teachers colleges there is a tendency to centralize many administrative functions in the office of the agency of control. This centralization of administrative functions includes such items as the following: central purchasing, the right to approve or disapprove all requisitions for supplies, approval of faculty appointments by one or more executive officers in the central office before ratification by the board of control (in one state the state commissioner of education insists upon interviewing all persons nominated by the presidents for appointment to the professional staffs of the teachers colleges), determination of curricula, and fixing of admission requirements. In one state all payments for board and room rentals by students, even though the students live in private homes, are transmitted to the general revenue fund of the state. An item covering board and room rentals of students is then included in the appropriation by the legislature for the operation of the teachers colleges. In this state profits from the operation of dormitories contribute a considerable share of the operating revenues of the teachers colleges.

The items listed in the preceding paragraph were presented for the purpose of illustrating the extent to which centralization of administrative functions has accompanied centralization of control. Research is needed to determine a proper distribution of administrative functions between the executive office of the agency of central control and the administrative office of the teachers college.

2. *Selective Admissions.* There is an increasing interest in and necessity for selective admission to teacher-training institutions. This problem is relatively new to the state teachers colleges. During the first half of the last decade, when there was a shortage of teachers, the problem of the teachers colleges was one of recruiting students rather than one of selection. The necessity for selection came first in the municipal teachers

colleges, due to the fact that a surplus of teachers existed in the cities before it did in the rural areas. At the present time the problem must be faced by all teacher-training institutions.

In meeting this new problem the state teachers colleges will encounter difficulties not present in the municipal institutions. The municipal institutions are generally free to fix requirements for admission, and to exclude those applicants who do not meet these requirements. In some states, state teachers colleges are not authorized to exclude any high-school graduate residing in the state who seeks admission. The city teachers colleges, since they are under the same control as the public high schools from which they draw their students, are able to secure a maximum of coöperation from the high schools. This coöperation generally has taken the form of careful records and student ratings and of advisement by members of the high-school staffs. It is relatively easy for the officers of the municipal teachers colleges to arrange for interviews with all applicants for admission. The state teachers colleges will find it difficult to secure such close coöperation with the secondary schools.

There is a need for careful research for the purpose of determining proper bases for selection. Such evidence as is available tends to show that the intelligence test does not contribute greatly to the information needed on which to base selection from among a group who completed an academic course with good standing from an accredited secondary school.[7] Presumably a satisfactory minimum of intelligence is almost guaranteed among such a group. The need appears to be for the determination of those qualities, and for means of discovering and measuring those qualities which are predictive of teaching success and which are not measured by academic marks or by intelligence tests.

III. TEACHER DEMAND AND SUPPLY

The need for accurate and detailed studies of teacher demand and supply is being recognized in all sections of the country. Such studies as have been made in this field have been for the most part inadequate and sadly lacking in accuracy. In only a few of the states is reliable and complete information available with reference either to the supply of or the demand for public-school teachers. State education departments, the logical source of such information, usually do not have complete and accurate data, and such data as they do have are likely to be

[7] *Intelligence Test Scores in Relation to Success in the Connecticut State Normal Schools.* Special Education Bulletin, No. 1, Connecticut State Board of Education, 1930.

in such form as to be almost inaccessible. Doubtless this situation will be corrected in many states in the near future, but at present the research worker in this field will encounter many obstacles in the way of securing complete and reliable information.

The recent research bulletin of the National Education Association on *Teacher Demand and Supply*[8] illustrates very well the present unsatisfactory situation as regards research in this field. For reasons which are readily understood, those responsible for this study turned to state departments of education as their principal sources of information relative to teacher demand and supply. Only fifteen of the states were able to supply figures on the annual demand for new teachers which were based on actual records. Eighteen additional states, including the District of Columbia, supplied estimates. In the cases of several of the states these estimates appear to be highly unreliable. Kentucky, for example, (Table 10 of the study) reported an annual demand for 3,500 new teachers in 1929-30. Of these, 3,200 were reported as experienced, and 300 as inexperienced, with only 150 new teachers coming to the state from other states. In other words, we are asked to believe that Kentucky, with a demand for 3,500 new teachers that year supplied 3,050 of this number from experienced teachers in that state who returned to teaching in 1929-30 after an absence from teaching of one year or more.

As one means of arriving at an estimate of the national demand for new teachers, those responsible for the study asked the state departments of education to answer this question: "On the average how long do teachers remain in service in your state?" Replies to this question were received from thirty-three states. The median of the replies was 5.77 years. The annual demand for each state, and for the entire country, was then computed on the basis of this estimated six year teaching life. For the country it yielded an estimated demand, for replacement only, of 145,291.

Estimating the annual national demand for new teachers for purposes of replacement on the basis of the answers to the question quoted above might be justifiable provided the following conditions prevailed:

(1) Provided the answers were reliable. It may safely be stated that no state department of education has reliable figures on which to base an answer to this question. It is not too much to

[8] "Teacher Demand and Supply," *Research Bulletin of the National Education Association*, IX, November, 1931.

say that this is a question which simply cannot be answered for any state. It can be answered for any teacher only when that teacher has permanently left the teaching service. It could be answered for a given state only after every teacher who began his teaching career at a given time had permanently left the service. Thus, if we had the complete service records of all teachers who began teaching in 1870, we could answer the question: On the average how long did those persons who began teaching in 1870 remain in the service?

There is excellent reason to believe that the estimate of an average teaching life of 5.77 years was far too low. This belief is substantiated by the annual demand figures supplied by the thirty-three states, which totaled 69,181. There were in these states approximately 70 percent of the nation's teachers. If the demand in the sixteen states which did not report was similar in amount to that in the states which did report, there was a demand for replacement and expansion of approximately 99,000.

Further evidence that the estimates of average teaching life were too low is supplied by reliable figures for Connecticut relative to the length of service of all teachers employed in Connecticut public schools in 1929-30.[3] A table shows the distribution of the entire teaching staff of the state with respect to length of service rendered. At the beginning of the school year 1929-30 the average was 11.5 years. This figure does not provide the answer to the question as to how long teachers remain in the service in that state, but it does indicate that the average teaching life in that state is considerably in excess of 11.5 years. In further substantiation of this point is the fact that 80 percent of all the graduates of Connecticut normal schools who graduated in 1925 and began teaching that year in Connecticut public schools were still teaching in Connecticut public schools in 1930.

(2) Provided teachers remained in the states in which they began their teaching careers. Even if we might assume that a state education department is able to answer the question of how long, on the average, teachers remain in service in that state, we would still have no measure of the total length of service rendered by those teachers.

[3] *Proceedings of the Annual Conference of Connecticut Normal School Faculty Members.* Bulletin Connecticut State Board of Education, Hartford, Connecticut, 1930, pp. 54-56.

(3) Provided average teaching life did not change and that the demand for teachers tended to be fixed or constant. There is reason to believe that the average length of teaching life tends to increase as the length of the required pre-service training for admission to teaching is increased. In the N.E.A. study the statement was made (page 312) that the demand for teachers tends to be fixed. Actually the reverse of this statement probably is true. Retirement provisions, salary schedules, tenure regulations, certification requirements, economic conditions, all operate to affect the demand. Some of these factors doubtless operate significantly only over long periods, but such a factor as changing economic conditions can influence significantly the demand from one year to another.

The data presented relative to teacher supply in the N.E.A. study are even less satisfactory than those relative to the demand. They grossly over-estimated the supply from teacher-training courses in high schools, accepting without question the faulty data on this subject presented in the Biennial Survey of Education, 1926-1928, United States Office of Education. They failed to include for some of the states in their tables on supply the graduates of teacher-training courses in colleges and universities. Such an omission permitted them to show for New York, for example, a shortage of trained teachers amounting to 4,732, and, for the thirty-three states for which figures were presented, a shortage of trained teachers amounting to 7,448.

Generally the inadequacy of the data presented in this study was recognized in footnotes and other inconspicuous places in the study. However, this did not prevent those responsible for the study from drawing strong and unwarranted conclusions. Among the most important of these were the following:

(1) (p. 313) "A conservative estimate is that the annual demand in the United States is for 110,000 to 120,000 new teachers."

(2) (p. 349) "If we accept two years of training beyond high school as the minimum professional training for teaching, there was in reality a widespread shortage of trained teachers in 1929-30."

Let us examine the tenability of these important conclusions in the light of data presented in the study.

(1) Was there an annual demand for 110,000 to 120,000 new teachers in 1929-30?

The thirty-three states which supplied information on this subject, reported a total demand of 69,181 for 1929-30. If the

demand in the remaining states was in the same proportion to their total number of teachers the national demand would be approximately 99,000 a mere 11,000 under the most conservative estimate quoted above. It is necessary at this point to consider the definition of a new teacher which was employed in reporting the demand. The question which the state departments of education were requested to answer was: "How many regular full-time teachers were appointed to public day-school positions in 1929-30 who did not serve as public school teachers in your state in 1928-29?" Obviously, the demand figures included:

(a) The number of inexperienced teachers appointed.
(b) Experienced teachers within the state who returned to teaching after an absence of one year or more.
(c) Experienced teachers from other states.

Equally obviously, from the point of view of the need of the country for new teachers, an experienced teacher who merely transfers from one state to another is not a new teacher at all. From this point of view, and from the point of view of the number that must be trained each year, the only significant figure is the number of inexperienced teachers who were appointed. The thirty-three states reported 53,363 such persons. This would indicate for the entire country a demand for 76,230 inexperienced teachers. The conclusion is clear that there was absolutely no justification for the statement that "the annual demand in the United States is for 110,000 to 120,000 new teachers."

(2) Was there a shortage of trained teachers in 1929-30?

The number of inexperienced teachers reported as having been appointed in the thirty-three states was 53,363. The trained supply reported in the study for these 33 states was 52,066. To compensate for the apparent shortage of 1,297, there is the fact that the data on the trained supply specifically included only graduates of state teachers colleges in the following states: Connecticut, Maine, Massachusetts, New Hampshire, and New York. The Biennial Survey of Education for 1926-1928 reports 27,556 students enrolled in teacher-training courses in colleges and universities in those five states in 1927-28. The conclusion is inescapable that on the basis of the data presented in the N.E.A. study there was no justification for the most important conclusion that "there was in reality a widespread shortage of trained teachers in 1929-30."

RELIABILITY OF DIAGNOSIS OF ERROR IN MULTIPLICATION OF FRACTIONS

LEO J. BRUECKNER
University of Minnesota
and
MARY ELWELL
Duluth State Teachers College

IN recent years, reports of comprehensive analyses of the errors made by pupils in various arithmetic processes have been made by Brueckner,[1] Buswell,[2] Morton,[3] and others. The findings of these basic studies have suggested the necessity of extending the scope of the analysis of pupil errors to such questions as those related to the validity and reliability of the diagnosis made. In the earlier studies no attempt was made, for example, to determine the consistency with which a particular kind of error would appear in the pupil's work. Obviously, it is important to discover whether or not an error in procedure in solving a single example in a test is a chance error or one that will persist in other examples of a similar type. In an attempt to develop a method of studying the consistency of error by pupils, the investigation herein reported was undertaken.

The procedure followed consisted in analyzing the errors made by fifth-grade pupils who had completed the subject on four examples of each of six of the forty different types included in the Brueckner Diagnostic Test[4] in the multiplication of fractions. The six types used were as follows:

Type A.	$\frac{3}{4} \times 10 = 7\frac{1}{2}$	Whole number multiplied by fraction. Cancellation. Product is mixed number.
Type B.	$\frac{8}{11} \times \frac{3}{4} = \frac{6}{11}$	Proper fraction multiplied by proper fraction. Cancellation. Product is proper fraction.

[1] Brueckner, Leo J. *Diagnostic and Remedial Teaching in Arithmetic.* Philadelphia: John C. Winston Company, 1930.

[2] Buswell, G. T., and John, L. *Diagnostic Studies in Arithmetic.* Chicago: University of Chicago Press.

[3] Morton, R. L. "An Analysis of Pupils' Errors in Fractions," *Journal of Educational Research,* X, pp. 117-125.

[4] Brueckner, Leo J. *Diagnostic Test in Multiplication of Fractions,* Minneapolis: Educational Test Bureau.

Type C.	$31/4 \times 10 = 32\frac{1}{2}$	Mixed number multiplied by whole number. Cancellation. Product is mixed number. No reduction.
Type D.	$6\frac{1}{5} \times \frac{2}{3} = 4\frac{2}{15}$	Mixed number multiplied by proper fraction. No cancellation. Product is mixed number. No reduction.
Type E.	$4\frac{2}{3} \times 7\frac{1}{2} = 35$	Mixed number multiplied by mixed number. Cancellation. Product is whole number.
Type F.	$2\frac{1}{5} \times 3\frac{1}{8} = 8\frac{3}{4}$	Mixed number multiplied by mixed number. Cancellation. Product is mixed number. No reduction.

On the test exercises the twenty-four examples were arranged in random order on a single page. Space for all work of the pupil was provided. It was believed that this plan would prevent the pupils from recognizing examples of similar types previously solved. The pupils were allowed as much time as was needed to complete the work. In all 327 pupils in five different schools in five different cities were tested. The median number of examples solved incorrectly was 5.4; the range was from all correct to all 24 incorrect. The pupils were directed to do all of their work on the test papers. This made possible the analytical study of their errors.

The detailed analysis was made by one of the writers and in doubtful cases checked by the other. This insured relative uniformity of scoring. A complete record was made of the number of examples of each type missed by each pupil and of the variety of errors found in each example not solved correctly. It must be granted that this form of analysis has in it a subjective element and there may be a small degree of error in the diagnosis. It was the only method possible, however, under the circumstances. As a matter of fact, in only a few cases were the reasons for the error made not obvious. In some cases the types of faulty procedure used by the pupils were highly ingenious and could be analyzed only with great difficulty. The number of times this could not be done was too small to affect the general conclusions.

The first point investigated was the degree to which each pupil missed the four examples of each type. The data bearing on this matter are given in Table I.

Table I reads as follows: In 63 cases only one of the four examples of Type A was worked incorrectly, the other three examples being correct; in 45 cases two of the four examples of Type A were worked incorrectly;

TABLE I

VARIATIONS IN NUMBER OF FAULTY SOLUTIONS OF EACH TYPE

No. of Faulty Solutions	Type						Total No.	Total %
	A	B	C	D	E	F		
One	63	64	88	80	77	71	443	40.2
Two	45	36	53	45	34	48	261	23.7
Three	26	22	26	34	21	30	159	14.4
Four	34	26	57	39	30	52	238	21.6
Total	168	148	224	198	162	201	1101	99.9

in 26 cases three of the four examples of Type A were worked incorrectly; and in 34 cases all four of the examples of Type A were worked incorrectly. Similar data are given for each of the other five types. It is interesting to note that for all types there were more cases in which all four examples of a type were missed than only three of the four were missed. Pairs were missed more often than three or four of a type. There are no striking differences from type to type, although Type B was easiest.

The figures under total give the results for all types combined. In 1101 cases there were from one to four of the group of examples for each type solved incorrectly. In each case the pupil, of course, had all the time needed to solve all of the examples of the type. It will be observed that in 443 cases or 40.2 percent of all opportunities in which examples of a given type were actually missed, only one example of the four was solved incorrectly; in 261 cases or 23.7 percent of the total, two of the four were solved incorrectly; in 159 cases or 14.4 percent of the cases, three of four solutions were incorrect; in 238 cases or 21.6 percent of the cases, all four of the examples were incorrect. Obviously, the actual total number of incorrect single solutions was largest in those cases in which all four examples of a given type were solved incorrectly. One may conclude from the data in Table I that an error on a single example of a given type is not at all a reliable index of what a pupil is likely to do on another example of that type since in 59.8 percent of the cases pupils who solved one example of the four of a given type correctly missed from one to three of the remaining three. In only one case in five did a pupil who worked one example incorrectly also have errors on the other three examples of the same type included in the test. It seems quite evident, therefore, that a teacher should not be satisfied with a diagnosis based on a single example of a given type. The pupil should be given at least three or four opportunities to solve examples of one type since single errors may be largely chance or accidental.

The question as to whether an example is solved incorrectly due to a chance or accidental error or to some persistent fault can only be determined by analyzing the written work and diagnosing the reasons for the failure of the pupil to solve several examples of the same type correctly. If the pupil, for example, solves four examples of the same type incorrectly an analysis of his written work will usually reveal the reasons for the error. If the same mistake or combination of mistakes occurs in each of the examples incorrect, we may say that the error is likely to be constant, that is, it would probably recur again in similar examples. If each example of the type is missed for a different reason, we may say that the error is variable. The more variable the errors are, the more difficult it is to make a valid diagnosis.

In an effort to secure data on this point, a careful study was made of the specific error or combination of errors in each example. The errors on the examples of each type missed were then compared to discover the extent to which they were constant from example to example. The analysis was made as detailed as possible so that the errors isolated in each example were very specific. Table II contains a summary of the general classes of error that were discovered, the number of sub-types in each class, and the total number and percent of errors of each class found in the papers analyzed.

TABLE II

SUMMARY OF TYPES OF ERRORS IN MULTIPLICATION OF FRACTIONS IN ORDER OF FREQUENCY

Order	Type of Error	Frequency	Percent	No. of Sub-Types
1.	Lack of Comprehension of Process	995	28.9	52
2.	Computation Errors	865	25.1	6
3.	Difficulty in Cancellation	345	10.0	19
4.	Difficulty in Changing Mixed Numbers to Improper Fractions	305	8.9	19
5.	Difficulty in Reducing Proper Fractions	271	7.9	8
6.	Example Omitted	270	7.9	—
7.	Difficulty in Changing Improper Fractions to Mixed Numbers	266	7.7	12
8.	Errors in Copying	68	2.0	—
9.	Legibility	45	1.3	7
10.	Difficulty with Signs	8	.2	1
	Total	3438	99.9	

In all, 3438 specific errors were located. As might be expected, the largest single group of errors was due to lack of knowledge of how to proceed. In this group there were in all 995 errors, or 28.9 percent of the total. That these errors were of a wide variety of kinds is shown by the fact that there were in all 52 different sub-types in this group, each one

representing a peculiar variation in procedure. Errors in computation constituted about one-fourth of all errors, involving six sub-types. Another large group of errors, 10.0 of all, were due to cancellation. Here there were 19 sub-types. Errors in work with improper fractions constituted 16.8 percent of all errors. There were 27 sub-types here. In 7.9 percent of the cases the example was omitted. In such cases an analysis of error was not possible. Under errors due to legibility are grouped such errors as those due to spacing of figures, drawing confusing lines in cancellation, etc. In many cases only a single type of error was found in an example, while in one pupil's work as many as twenty errors were found in a single group of four examples, each example being missed for five different reasons, as follows:

The errors that were listed in this case indicate that the pupil failed to change the mixed numbers to improper fractions before multiplying, that he disregarded the integral parts of the mixed numbers, that he found the product of the fractional parts of the mixed numbers, that he inverted the product, divided incorrectly in three examples when reducing, and in one example failed to reduce the proper fraction in the product.

A comparison of the errors made by the pupils from example to example was undertaken to determine the consistency of error and the reliability of any diagnosis.

Consistency in this discussion will mean the occurrence of the same error two, three, or four times in any one of the six different types of examples used in the test. If a pupil is consistent in the errors he makes, he should make the same error in each of the examples of a type since all examples of a type present the same difficulties. For instance, if there is a reduction of a proper fraction in the product in one example, each of the other examples will have in the product a proper fraction to be reduced.

If a pupil is entirely consistent, he will make the same error or errors in all examples of the same type. A pupil may be considered partly consistent if he makes the same error or errors on two or three examples of the same type. If a pupil misses only one example out of the four in any type, he shows no consistency, and the error or errors in that one incorrect example may be only chance errors. Chance errors are frequently due to carelessness in multiplying or dividing. If consistency were to be shown by the fact that specific errors persist throughout all types of examples on a test sheet, then a study of the errors occurring

on only one example of several types would be most useful in suggesting remedial measures. If there is no consistency, many examples of a single type must be used as the basis for diagnosis.

In order to study the consistency of errors in examples of the same type a code system based on a special classification which summarizes the tabulation of errors for each example was devised. The tabulation was made on large sheets of cross section paper, one vertical line to an example and one space to an error. If one example of a type is missed, it may be missed for one reason or for several reasons. For instance, an error tabulated as 1c would mean that the pupil had made a mistake in multiplication, an error listed in the table as c under the heading I, computation error. If the notation 1c is given in one column in the

3a

tabulation of errors in one example, it shows that the pupil has made two errors, one of which is a mistake in multiplication and the other a failure to reduce a proper fraction in the answer. In the example which follows, $\frac{5}{6} \times 14 = \frac{68}{6} = 11\frac{2}{6}$, the pupil made a mistake in multiplying 14 by 5 and failed to reduce $\frac{2}{6}$ to its lowest terms. Two errors on one example are classified under the heading, combination of two. If the notation 1c is given in one column in the tabulation or errors in one

3a
6e

example, three errors have been made, and this is classified under the heading, combination of three.

For each of the cases where two, three, or four examples of a type were missed, the classification was enlarged to take care of the new combinations occurring. In the case of two examples missed the classification was made under the following headings: Identical, Constant and Variations, and Varied. Identical errors may be sub-divided into single, combination of two, combination of three. A constant and one variation is illustrated by the notation 3g 3g. A constant and two variations is

9c

illustrated by 3g 3g. There may be a combination of one constant and

9c
8b

several variations, and the tabulation then appears in such a form as 3g 3g and is classified under one constant and four variations, 1c, 4v.

9c
6m 8b
5a

Then there may be two constant errors and a variation which is shown in a tabulation such as 1e 1e. There may be a great number of
3a 3a
6f
variations with one, two, three or more constants, although three is the greatest number of variations found in the classification of errors on two examples missed.

Under the heading of Varied are classified all the errors where no constant element appears. For instance, a tabulation, 3g 5a, is classified as Varied: single; a tabulation, 3g 5a, is classified as Varied: combina-
8m
tion of three, 2 – 1, in which there are two errors 5a in one example and
8m
one error, 3g, in the other example.

For three examples missed the combinations of errors are arranged under four headings: Identical, Constant and Variations, Pairs, and Varied.

A new possibility appears in the case of three examples missed because two of the examples may have the same error. This condition is listed under the name of pairs. In combination with a constant error the notation appears as 3g 3g 3g. Obviously a pair of errors could not
8m 8m
appear without either a constant or at least one variation for there are three examples missed.

The classifications under Varied follow the same plan as that used when two examples were missed. For instance, the notation 1d 2al 6f
3e 8e
5x
is classified as Varied: combination of six, 1 – 2 – 3, indicating that all the errors are different and that there is a single error in the first example, two errors in the second, and three errors in the third example.

In the case of four examples missed, the classification headings are Identical, Constant and Variations, Triplets, Pairs, and Varied. A triplet is the same error occurring in three examples. Triplets which may appear separately if there are two sets, or may appear with constants, or with pairs, are the new feature in the classification of combinations of errors when four examples are missed.

The combinations under the heading Varied are similar to those illustrated for two and three examples missed, but the combinations may have greater variety.

One is at once struck with the possibility of variety of error from example to example. In this report it will not be possible to present the many variations actually discovered. These are all given in the original study.[5] Suffice it to say that practically all possible combinations were found. Summaries only will be given here. Table III contains the essential data.

The data in Table III are divided into four parts. Part A gives the combinations of the errors found in single examples missed; Part B gives the variations found when two examples of the four included in the test were missed; Parts C and D give similar data for three and four incorrect solutions respectively. The percents for each part total 100.

The data in Part A show that single examples were missed for from one fault to a combination of as many as four faults. By far the largest number were missed because of a single fault. This fact suggests that these errors were largely accidental or chance, since they did not persist.

TABLE III

VARIATIONS IN ERRORS FOUND

Types of Errors	Number	Percent	Total Percent
(A) Single Example Missed			
1. Single error	374	84.4	84.4
2. Combination of two errors	49	11.1	11.1
3. Combination of three errors	19	4.3	4.3
4. Combination of four errors	1	.2	.2
(B) Two Examples Missed			
1. Identical error (Single or combination)	63	24.1	24.1
2. Constant with variation	18	6.9	6.9
3. All varied			69.0
(a) Single	133	51.0	
(b) Combination	47	18.0	
(C) Three Examples Missed			
1. Identical error (Single or combination)	20	12.6	12.6
2. Constant with variation	19	11.8	11.8
3. Pairs with variations			46.7
(a) One pair	65	40.9	
(b) Two pairs	8	5.0	
(c) Three pairs	1	.8	
4. All varied errors			28.9
(a) Single	19	11.9	
(b) Combination	27	17.0	
(D) Four Examples Missed			
1. Identical error	38	16.0	16.0
2. Constants (with variations)	66	27.8	27.8
3. Triplets (with or without variations)	63	26.5	26.5
4. Pairs (with or without variations)	54	22.7	22.7
5. All varied			7.0
(a) Single	6	2.5	
(b) Combinations	11	4.5	

[5] Elwell, Mary. *Reliability of Diagnosis in Multiplication of Fractions.* Unpublished Master's Thesis, University of Minnesota, 1932.

The data in Part B show that when two examples of the four were missed in only 24.1 percent of the cases was the incorrect solution due to identically the same fault or combination of faults. In 6.9 percent of the cases there was a constant error in both examples in combination with a varied error, different in each example. In 69.0 percent of the cases the faults in both examples varied completely; that is, each example was missed for a different reason or combination of errors. Of these varied errors 51.0 percent were single errors and 18.0 percent were combinations. It is, therefore, evident that when two examples of the four were solved incorrectly, the faults were highly variable. In less than one-third of the cases was there any evidence of persistency of faults.

When three examples of a single type were solved incorrectly, the degree of consistency of faults increased and the extreme variation was reduced. In only 12.6 percent of all cases were the three examples missed for identically the same reason; in 11.8 percent of the cases there was a constant error common to all examples, but in addition to this common error there were also variations in combinations. In 46.5 percent of the cases two of the three examples missed had a common error which might appear as a combination of a single, double, or triple error with variations of all kinds. In 28.9 percent of the cases all three examples were missed for reasons that varied from example to example. These in about one-third of the cases were single errors; the remainder were combinations of various kinds. It is thus clear that in 71.1 percent of the cases there was some degree of consistency of error when three examples of a type were solved incorrectly, varying from complete consistency to cases in which two of the three incorrect examples had a common error that occurred together with variable errors of different kinds. The increased consistency of faults is probably due to the fact that a pupil who fails to work as many as three examples of a given type correctly has some difficulty with the process involved. The variations may be due to accidental or chance errors, or to random trial of faulty procedures that he thinks may possibly secure the correct answer.

When all four examples of a given type were solved incorrectly a relatively high degree of consistency of error was revealed. In only 7 percent of the cases were all four examples missed for varied reasons; in 16.0 percent of the cases were all four missed for identically the same reason; in 27.8 percent of the cases all four were missed for the same reason but there was in addition some other error which varies from

example to example; thus in 43.8 percent of the cases was there a fault common to all four examples. In 63 cases or 26.5 percent of the total three (triplets) of the four examples were missed for the same reason together with various combinations of faults; in 54 cases or 22.7 percent of the cases two of the four examples were missed for the same reason together with variations of various kinds of faults; these two groups constitute 49.2 percent of all cases. These facts make it clear that when a pupil fails to work four examples of a given type correctly it is likely that there is some difficulty or faulty procedure which tends to persist. The diagnosis of this fault thus affords a reliable basis for remedial or corrective work.

There were certain errors which were much more persistent than others. For example, 1c and 1d, which represent multiplication and division errors, occur 296 and 311 times, respectively. Usually they were not constant errors of a type but were scattered throughout the types. The error listed as 3a, failure to reduce a proper fraction in the product, occurred frequently as a constant error.

The error listed as 2d1, which is inverting the multiplicand, usually appeared as a constant error in a type and sometimes occurred in four or five types. The error, 2e6, disregarding the integral part of a mixed number, appeared usually as a constant error. Failure to reduce an improper fraction to a mixed number occurred 144 times but usually was a single error.

The error, 6a, cancelling different factors from numerator and denominator, usually occurred as a chance error.

Examples of the types C and F not only had the greatest number of errors occurring but more constant errors than in the other types. Type C is the multiplication of a mixed number by a whole number, in which there is cancellation, and the product is a mixed number. Type F is the multiplication of a mixed number by a mixed number, in which there is cancellation, and the product is a mixed number. A great number of the errors occurring were due to the failure to reduce the mixed numbers to improper fractions before multiplying, disregarding the integral parts of the mixed number, or cancelling an integral number with the numerator or denominator of a fraction, or multiplying together only the fractional parts.

The largest number of constant errors appeared on the papers of those pupils who missed a large number of the examples. This would seem to indicate that the weaker pupils are more consistent in the making

of errors than the better pupils, and therefore the diagnosis of their mistakes would be reliable to a much greater extent than for the better pupils.

IMPLICATIONS

Diagnosis of difficulty on the basis of an analysis of the written work on a test containing single examples of given types is likely to be unreliable and invalid. Such a test may be used to locate the types of examples that may be causing difficulty for most pupils in a class, but it is not a safe basis for individual diagnosis of faults causing incorrect solutions. At least three examples of each type should be included in a test for individual diagnosis, since errors on single examples are, in many cases, likely to be due to chance or mere accident. In this study it was found that there was a relatively high degree of consistency of the type of error or specific fault found in a pupil's work when as many as three or four examples of a single type were solved incorrectly.

THE ADMINISTRATION OF PUBLIC SCHOOL RESEARCH POLICIES[1]

JESSE B. SEARS
Stanford University

I

RESEARCH bureaus in public school systems came into existence in the United States as early as 1912. The movement, now scarcely two decades old, spread rapidly from the outset and it may fairly be stated that in the administration of American city school systems research is now accepted as a necessary function.

It must be conceded by those engaged in this type of service that from the beginning the term research has been used loosely to cover a wide variety of studies, some of which cannot truly be classed as research. Without pausing here to consider the propriety of thus broadening the connotation of the word research for this special purpose, it may be suggested that a careful examination of the output of these departments or bureaus by members of research associations might be useful not only in bringing to light any incorrect usage of the term, but also in further clarifying the function of research in school systems.

The purpose here is not to review the history of the school research movement. This has been done very well in a recent monograph published at Ohio State University.[2] From an examination of the output of school research bureaus, however, and from contact with the work through survey studies, I am convinced that school research has outgrown the tiny niche assigned to it at the outset and that at the present it is in need of administrative attention. By this I do not mean to imply a criticism of the work, nor is it intended to urge a complete standardization of the machinery, the processes, or the fields of research. This would be deadening in so young an enterprise.

The present weaknesses, or shall I say opportunities for improvement, of school research seem to be about as follows:

1. There is the lack of a well defined research policy.

2. The program of activities is not sufficiently unified and comprehensive.

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[1] Address before the California Educational Research Association, Fresno, California, April 24, 1931.

[2] Chapman, Harold B. *Organized Research in Education.* Ohio State University Studies, Bureau of Educational Research Monographs, 1927.

3. The machinery for directing the service is not properly adjusted to the administrative mechanism.

4. Our methods of building up programs of research are very inefficient.

5. There is no suitable means for bringing the results of research effectively to bear in school management.

For very good reasons these weaknesses, the existence of which few would contest, are not to be regarded as criticisms. The outstanding achievement of this department in public school systems is well established, and these weaknesses are but the natural maladjustments and growing pains of a new activity being added to an already complicated enterprise, and it must take the usual time to find its place. Only by the rapid growth of this function have we been able to see ahead to the larger possibilities of the service which these apparent weaknesses suggest.

To date we can hardly claim to have conducted a controlled experiment in school research. Yet, with nearly two decades of experience to look back upon, it should be possible to evaluate roughly our research departments, and by inspection and analysis to rule out many of the crudities incident to youthful planning. We believe that we now know something basic about instruction, curricula, supervision, buildings, finance, and administration. In the light of this knowledge we should be able to give intelligent direction to research as an instrument for rationalizing our school program. What I have to say is an attempt to examine the general drift of our experience and from the standpoint of sound administrative theory to offer a few suggestions for refining its adjustments to the major purposes, plans, and processes of the school system.

II

The development of a research policy must begin with a clear understanding of the broader needs of the school system and with an equally clear idea of what can be done by means of research. Research is not a fairy wand to be waved over difficulties. Its aim is to clarify, to the end that development of objectives, plans, and procedures may be governed by knowledge in place of guessing. Research is the very best of insight and straight reasoning applied systematically as a means of rationalizing a situation. It moves with deliberation and always in terms of facts and principles. It discriminates between facts and half facts, and between facts that bear and those that do not bear upon the

answer. When its facts are arranged at last, then by insight and extended knowledge it extracts their meaning and sets it up as the answer to its question.

In formulating a research policy one may legitimately ask: First, do we need research? Have we questions that require the careful insight and straight reasoning of research? There are, obviously, many such questions. Before we can claim to need research we must be willing to admit that somewhere in our schools we are puzzled and uncertain about what to do, or how or why to do it. This is the attitude of the scholar, the inquirer, the man with an open mind. Is it the typical attitude of the practical, self-confident, hard-headed administrator? Too often, I fear, research has entered our schools not because school administrators were convinced of its importance but because it seemed to be a popular idea and offered an attractive new administrative toy. I am led to this fantastic explanation only because I have seen so many reports from research departments that should have been compiled by principals, secretaries, or better, not compiled.

Having established a need for research, the second question that may arise for the policy maker is that of how much research the schools can afford. What they can afford will dictate the number of workers, and so, have a bearing upon the question of selecting things to be done. If the budget, and so the program, must be greatly limited, then the relative importance of studies must be settled. It is not meant to overlook here the fact that individual teachers may carry on certain types of research unaided.

The third question of policy pertains to the fields and the types of studies that may be undertaken. My own observations lead to the conclusion that in this important matter policies have been in need of attention. What is going on elsewhere, and not careful studies of the schools' needs, seems too often to have oriented the research program. This, inevitably, means that the results of the research are in danger of being treated as ends instead of as means. On the other hand, we have plenty of excellent illustrations of where the research machinery has been set up to solve certain problems that had to be solved. What is alluded to here is our need for clearly thought out programs of research to replace the isolated, scrappy, hit-and-miss work that is so commonly found.

Still another question of policy is: How shall research be administered? How to place authority and responsibility for such an undertaking is important, and, at least in its externals, it has been better

handled than have some other aspects. Chapman's study, referred to before, showed that 56 percent of the cases reporting the service were headed by a director, and in about 18 percent by an assistant superintendent. This implies that its field is the entire school system and that its head is responsible directly to the superintendent. In actually directing the service, however, all the information I have found shows that those in charge of research service administer other activities than research or assist with supervision, guidance, business, or clerical and statistical work. It is clear to me that for the internal administration of research departments we have not yet found a perfect solution.

Finally, what are the ends of research? How are the findings to be applied? Is it merely published reports we want, or do we mean to make our findings effective in perfecting our instructional program? If not the latter, then it is probably not worth the price. In this I think we may say we have a mixed showing. There is no doubt that research results are being widely applied. Often this seems to be done in a loose fashion, but that it is affecting every phase of school work is clearly evident. It is giving us better curricula, better teaching and supervision, better business service, and better buildings.

In the light of our experience to date it would seem that any attempt at stock-taking in this field might be fruitful in pointing the way to a revision of our research policies and of our machinery for research. In this paper I shall attempt to outline briefly my own conception of research as a function of public school systems and of how this function may best be performed. For purposes of clarity I shall have in mind a large city school system where a high degree of specialization is possible. I choose to speak in terms of a specialized program because by so doing the principles can be made clearer. Further, in administration it is easier to solve a small problem if we have first solved a large one than it is to solve a large one after having solved only a small one.

III

What shall the research program include?—The possible field of school research is large. It ranges from the philosophical question of the relative values of studies and activities, through the psychological and biological questions of how children learn and how teachers teach, through the field of organization of children, of teachers and of subject matter, to the questions of how best to clean floors or to keep accounts or purchase supplies. In dealing with these problems too, the possible range is from what may be termed pure research to the solving of the

most commonplace of problems in the applied field. What shall be our point of attack? Where in this broad realm shall school research stake out its claim?

In 1920 the Bureau of the National Research Council listed the names of 300 business firms in the United States each of which maintained a research laboratory. The year following, the list was revised and included 526 firms. In 1927 another revision brought the number up to 1,000. The United States Bureau of Standards has listed over 200 research departments in commercial firms, and at the present time there are 85 municipal research bureaus operating in the United States, 10 of them publicly supported. These figures should be most reassuring to school administrators. Many of these private enterprises are conducting what may fairly be termed pure research as well as applied research, and they find it a good investment.

For a school research department the question of whether researches are pure or applied is primarily a question of how directly or how indirectly they are attacking the problems of the school. For so young an enterprise we should have no hesitancy in confining the program to very direct attacks upon problems with reference to which definite action must be taken. To work on a purely theoretical problem of taxation or of habit-formation or of personality analysis or of inheritance might be of value, but this is too vague and indirect an approach. Instead, for the present, let the program be confined to problems in which an important decision must be made. In other words, let us do no searching for knowledge unless the knowledge is required to direct our school service.

If we accept this point of view and take school systems as we find them, we at once face the question, what research studies are of most worth? What aspects or divisions of the system should we try to cover? The answer to this, I think, is clear. It should cover the entire system, taking problems in the order of their importance and in the order of the chance our department would have to find a worth while solution. This implies that we must have an efficient means by which the needs for research may be brought to light. With this important matter this paper will be concerned later. Here I wish to emphasize the importance of making the field of research the entire field of service. The reason for this is: First, a school system is a single unified enterprise. If something is out of order in one part it is very apt to affect other parts. Working in one single field is apt to produce a patched school system and a

warped viewpoint in its development. Second, confining research to a single field more or less implies the assumption that other divisions can be operated satisfactorily without special study, which is not true.

This does not mean that the entire field is to be worked continuously. It does mean, however, that all parts should be surveyed continuously for problems, and that everyone in the system should be conscious that this larger field has been staked out, that surveys are covering the remotest corners, and that sampling is going on throughout all parts. The effect of such a program presents lopsidedness and produces in workers a sense of unity in the system and a consciousness of their responsibility beyond their own narrower confines.

IV

How may we organize a staff for such a program of research? From what has been said, it is clear that if research is to rationalize it must come very close to those who are teaching, administering, supervising, legislating, accounting, purchasing, and otherwise directing the schools. If it is to unify and coördinate it must stand in a like relationship to all parts of the system. This means that research must not be subordinate to any single department in the system, but only to the central authority. If the work is to have prestige, which it must have, since staff service has no authority except the authority of superior knowledge, then, as a department it must be coördinate in rank with the main divisions of the system.[3] "Assistant superintendent" as a title to indicate rank or position in the system, and "director of research" as a special title to indicate nature of responsibility would seem to meet this requirement.

Within the research department the director is the administrative head and the point of contact with other parts of the school system. The accompanying chart will serve to indicate the internal organization of the system as worked out in terms of an analysis of the functions or types of research to be done.

The director would be executive head and responsible directly to the superintendent. He would direct researches and develop research policies, and interpret research findings to others in the system and to the public when desirable. He would be a member of the superintendent's

[3] If research is made a minor sub-department it could not command the services of one who would possess superior knowledge. The title "assistant superintendent" establishes rank of first order and is desirable for that reason.

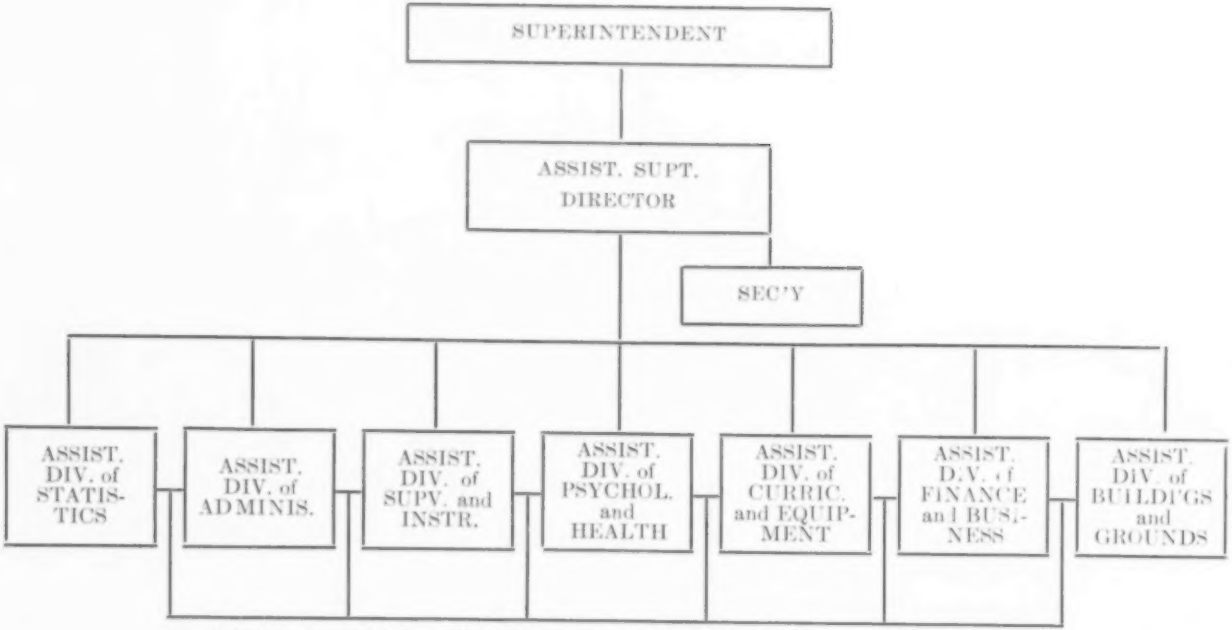
SUPERINTENDENT
ASSIST. SUPT.
DIRECTOR
SEC'Y
ASSIST. DIV. of STATIS-TICS
ASSIST. DIV. of ADMINIS.
ASSIST. DIV. of SUPV. and INSTR.
ASSIST. DIV. of PSYCHOL. and HEALTH
ASSIST. DIV. of CURRIC. and EQUIP-MENT
ASSIST. DIV. of FINANCE and BUSI-NESS
ASSIST. DIV. of BUILDGS and GROUNDS
(Attached here would be a chief clerk with a staff of statistical clerks, stenographic assistants, filing clerks, and library attendants.)

FIGURE 1. PLAN OF ORGANIZATION FOR A CITY SCHOOL DEPARTMENT OF RESEARCH

advisory board, direct the development of the budget for his own department, and aid in the development of general school policies.

Under the director seven divisions of service are suggested, each headed by an assistant and in charge of a special type or field of studies. These divisions: statistics, administration, supervision and instruction, psychology and health, curriculum and equipment, finance and business, buildings and grounds, are not mutually exclusive in the ground they cover, but this is not important. The main concern is that there be left no uncultivated areas in the system. In this division one important administrative principle, that of unity and thorough coördination and interlocking of effort, is provided for in two ways: first, by the fact that assignments will come to these divisions through the director who, through conferences, will pay special attention to the wider implications of the work of one division for that of another; second, through a single chief clerk who heads up and directs the staff of clerical, stenographic, filing, and library workers.

The division of statistics and records, it would seem, might well be in charge of all data for permanent statistical records and regular official reports—enrollment, attendance, progress, graduation, staff, buildings, budgets and cost studies. It would care for statistical questionnaires, and would assemble as archive material many statistical summaries, cumulative tables, charts and maps to show trends in various lines of activity. It would handle the statistical work, especially the more difficult machine work for all studies, and in general operate in large part as a service and consulting division for the other divisions. Obviously, the division must be headed by an expert statistician trained in research methods.

Each of the other six divisions might be headed by one specially trained in the field indicated and in research, and as head of the division would direct studies within that field. The administrative division would aid in isolating and solving problems dealing with legislation, organization, records and reports, marking systems, promotion schemes, special school or class projects, classification of pupils, time allotment, teacher rating, tenure, pensions, promotions, retirements, size of class, teaching load, attendance, and other allied topics. The supervisory and instructional division would be on the alert for new ideas in these fields, such as: creative education, teaching methods, testing, projects, special classes, teacher training in service, libraries, teaching devices, guidance, extra-curricular activities, and problems having to do with learning and teaching. The division of psychology and health would be in charge of studies

of individual children having to do with mental and physical health and development, with problems in physical training, social activities essential to personality development, feeding, sanitation, instructional hygiene, medical inspection and treatment, and the like. The business division would deal with problems in finance, debts, purchasing, storing, insurance, cleaning, repairing and gardening and especially with development of standards for materials and services. Similar points of contact with the practical operation of the schools will readily suggest themselves for the other divisions.

The point emphasized is that research is a necessary function at every point in the system and that systematic provision should be made to carry on the work required to make intelligent decisions. To be an effective machine for research the following requirements of the service must be fulfilled:

1. It must be well staffed, and well-organized.
2. It must actually contact effectively with all divisions of the system.
3. It must have capacity in staff and equipment facilities for keeping in close touch with scientific developments in every part of the field of education.
4. It must have final say as to data and methods in all studies undertaken and be in full charge of all who assist in research projects.
5. It must not destroy originality and spontaneity in the school staff. It must stimulate, encourage and provide sympathetic guidance to any project that has merit as an experiment or investigation in the system.
6. It must not regard its work as done until its findings are fully interpreted, directly or in writing, for those whose work it is to benefit.
7. It must faithfully give credit where credit is due.

V

One other task remains to make this explanation of school research administration complete, and it is after all the most important task. In the best of our school systems we have already attained in practice much, if not most, that has been proposed so far. The general theory of the function of school research as here set forth is widely accepted, and in certain places the theory is being given fairly good expression. Our further task is to clarify the principles and to stimulate a wider adoption of them and a more general application of them in practice.

In general, during the past, administrative theory has been worked out in practice and in a study of practice combined. Just now it seems to be true that in education our theory is exceptionally far ahead of our practice. This, I believe, is as true in administration as in curriculum making or teaching. My own study of the ways in which school research is handled leads me to the conclusion that some of our practices are poor and that we know enough theory to improve the practice if we will but apply our knowledge. The problem I have set for myself as a result of my observations is this:

School research projects are decided upon by a wrong method and they are carried through with much loss of time, energy, and actual return from the studies. In general, the weaknesses of the service as set forth at the outset of this paper obtain largely because we fail to apply well-known principles in its administration. How then, can right principles be applied? First, we must have sound organization, competent personnel, and proper housing and equipment, as set forth above. Further we must do good administering.

The following is proposed as an administrative procedure, call it an hypothesis for an experiment if you prefer, as a means of doing away with the types of weaknesses I have enumerated:

1. Let demands for research projects originate among the workers of the system as well as with the research workers. Let it be the superintendent's policy, that any officer, from janitor up, is to be free to suggest problems for research and that every suggestion will be examined; further, ability to see and define problems that need study is regarded as evidence of ability and of effort to keep abreast in the profession. Here the object is to stimulate a critical attitude toward work, and to create a respect for and a readiness to utilize the results of research. Only with such a policy clearly enunciated and practiced can the proper foundation for research be laid.

2. Let any worker who wishes to participate in research have a chance to do so if he has any capacity either to learn from it or to contribute to its success.

3. Let it be one special duty of the research director to stimulate thinking of this sort throughout the system, to encourage study or experiment wherever it springs up, and to do all he can to train the school staff in scientific methods of work. This is part of a training-in-service program.

4. Let the research group have wide latitude in looking about the system for important problems. This should have the effect of providing what would be very close to a continuous, more or less outside, examination.

5. Let no research be entered upon until the possible uses of its findings have been thought out and until contact with every step in the study has been provided for those upon whom its uses would fall. This insures that the work will effect practice and not become a mere academic performance.

6. Finally, let the year's program of research be budgeted by a plan that utilizes the best principles of modern financial budgeting. This plan may now be illustrated.

Inevitably the staff service required by a school system will call for a study of many relatively simple as well as many extremely difficult problems. Some will require little and others much time to complete. Some will have a simple conclusion, the direct use of which is obvious, while others will bring to light evidence that points suggestions in many directions. A research in the curriculum is very apt to involve both teaching method and the devices and equipment by which the curriculum is administered. Some researches will be handled almost solely by the research staff. Others will require the coöperation of a large number of other school workers.

Having in mind that as far as possible every member of the school staff is to be brought into as close touch as possible with research work, especially in his own field, and that as far as possible all are to aid in discovering research problems, and especially that each member is to be responsible for making the results of researches in his own field effective in practice, there will be need for some system for harmonizing all these efforts and purposes.

For this the following machinery is suggested:

Let each administrative officer be responsible for stimulating the study of problems by his subordinates. Day after day entangling situations will arise: New books will provoke inquiry as to the merits of present practice, a piece of machinery breaks down, or the growth of the school in numbers creates new difficulties. These situations provoke thought and discussion. Possibly at some point the research director is requested to come in for a conference or a committee is sent to the department for advice. Slowly a problem emerges. It is placed on a temporary list. Others accumulate, and they are not all clear; they seem to over-

lap. It is thought that they may be similar to problems in like situations in other schools. As the weeks pass the list grows. For each problem the group will work out as clear a statement as possible of what it is that vexes, or of what they need to know, why they need to know it, what bearing they think its solution would have upon their work, and when they would be able to use the results of a research on the problem if such were available.

At the beginning of the last quarter of the year let a call be sent out for reports on proposed research projects for the ensuing year. The list for each school, with each problem explained as suggested above will be organized by the principal and teachers and possibly some by the principals and janitors. Like lists will come from supervisors, from heads of services like attendance, health, guidance, business, finance, buildings and grounds, purchasing, and accounting. These lists will be assembled at the research office and there carefully classified into groups and a carefully arranged typewritten account of every project with its source indicated and each especially labeled as to the time when the results can best be put to use if available.

During the year it must be remembered that throughout the system discussion is going on over new developments that are to be considered for the succeeding year. Principals have discussed innumerable problems with their teachers and possibly by the time this research budget is begun the superintendent will have gone over most of the suggestions that are to be offered for important changes or additions for the ensuing year. His own policies have been reshaping themselves and his plans have been maturing. Ultimately all this will issue in concrete form in connection with the building of the financial budget. This is noted here because the researches will be closely tied into these same plans.

Finally the superintendent, in accord with a calendar date, will call his counsel or cabinet together to study the preliminary rough draft of the research budget. The research director presents the collected proposals, explains his analysis and shows how many of the projects can be joined together for study, and expresses his judgment as to the relative importance and relative difficulty of the various groups. He states also whether the list is too large for a year's work. The list is then gone over by the counsel and the projects are checked as to their bearing upon the major projects that are being planned for the next year.

With this analysis the collection goes back to the research office where the budget is finally shaped. When this has been done, explanations

should be made and necessary conferences should be held with those whose projects have been denied a place. With the results of this study the research budget is ready for final review by the counsel. This accomplished, it can then be arranged upon a calendar and full announcement made of the plans.

The development of such a calendar must take account of the time required for each project and it must provide for time that will be needed for consultation on current matters of all sorts or for special unanticipated needs. When this calendar is set up, then any item that is to be added should pass through the superintendent's hands to the director. Naturally this budget will not prevent the continuous use of the department by anyone who desires advice or suggestions.

The value of such a budget developed by such methods lies in the following facts:

1. It brings all the talent of the school system to bear upon all the aspects of the system, and so furnishes opportunity and stimulates all the school workers to think constructively about their work.

2. It prevents the research department from becoming clogged up with miscellaneous jobs of work of a semi-routine sort that might better be performed by line officers in the natural course of their work.

3. It unifies research around the basic policies and plans of the school system, making of it a constructive agency for rationalizing the school system.

4. It should aid materially in the development and maintenance of a morale that rests upon professional as well as upon personal and social foundations.

PROGNOSTIC TESTING IN MUSIC ON THE COLLEGE LEVEL: AN INVESTIGATION CARRIED ON AT THE NORTH CAROLINA COLLEGE FOR WOMEN*

GRACE VAN DYKE MORE
North Carolina College for Women

The purpose of the study.—This study was undertaken to satisfy a desire to offer constructive counsel to freshmen in the School of Music in order to avoid, if possible, many of the maladjustments that so frequently cause failure while studying music in college. No attempt was made to analyze fully nor to measure all the factors of musical ability; neither was there an attempt to secure a measure of musical accomplishment more reliable and valid than the teachers' marks. The study was concerned with finding a battery of tests possessing a considerable degree of prognostic value, and with determining the degree of that value.

STATEMENT OF THE PROBLEM AND ITS DEFINITION

A. What battery of group tests will be most effective in predicting the probable success of college freshmen who major in music?

B. With what degree of accuracy, by means of this battery of group tests, can the probable success in music study of college freshmen who major in music be predetermined?

It was considered desirable to have the final battery of tests consist of not less than three, nor more than six tests, so that they could be administered within a reasonable amount of time. Success in music study was arbitrarily defined to mean the earning of satisfactory marks, particularly during the freshman year, in college music courses: harmony, sight-singing and ear-training, and applied music. The degree of accuracy with which the probable success could be determined was to be measured by the correlation between the scores made in these tests and the marks or grades earned by the same students in their freshman music courses.

Music in the field of educational measurements.—Before undertaking the testing program of this investigation it was necessary to review the available tests in music and to make a critical evaluation of the studies in which these tests have been used.

While music has been one of the most recent subjects to receive attention in the field of educational measurements, the past fifteen years shows

*Now the Woman's College, University of North Carolina.

a considerable amount of work done in the construction and standardization of tests and the pursuit of experimental studies. Music tests are of two kinds: first, those intended to measure native endowment; and second, those intended to measure the use made of this endowment, or the achievement in music. Tests of the first sort, usually referred to as aptitude tests or as tests of musical ability, may be divided into three groups: (1) those intended to measure sensory capacities; (2) those intended to measure musical feeling; and (3) those intended to measure motor abilities.

Since tests in motor ability are necessarily individual tests and since the writer was concerned with group tests only, no study of investigations concerning motor ability was made. No investigations concerning tests of musical feeling could be found. This, therefore, limited the study to consideration of the tests of sensory capacity. These were the earliest type of music aptitude tests formulated and presented to music educators and psychologists.

Dr. Carl Seashore of the Iowa State University is the pioneer in this field.[1] His six tests, *Measures of Musical Talent*, are still the foremost tests of this type. These are tests of aural acuity or discrimination, and undertake to measure the least perceptible differences in pitch and strength of tones, the least perceptible difference in paired time intervals, differences and likenesses in paired rhythmic patterns, the comparative smoothness and blending qualities of paired combinations of two tones, and the tonal memory span for groups of tones. These tests are recorded on phonograph records, and full directions for administering and scoring them are available.

The need for a critical review.—After twelve years of use the Seashore Tests of Musical Talent are still on trial. They have their loyal defenders who consider the tests capable of analyzing the musical talent of the individual with almost unfailing accuracy, while several investigators have declared these tests are not of significant value to the music educator.

The writer of this study reviewed and evaluated nine studies in which the Seashore tests were concerned, (named in the footnotes, numbers 2 to 10, inclusive.) Among them were found three investigations reporting

[1] Seashore, Carl E. *The Psychology of Musical Talent.* (New York: Silver, Burdett & Co., 1919), 288 pp.
Seashore, Carl E. *Manual of Instructions and Interpretations for the Measures of Musical Talent.* New York: Columbia Phonograph Company.
Seashore, Carl E. *Measures of Musical Talent.* (six records) New York: Columbia Phonograph Company.

the Seashore Tests to be of a high degree of accuracy: Dr. Hazel Stanton[2] of the Eastman School of Music, Rochester; Flora Mercer Brennan,[3] and Dr. Max Schoen.[4]

Evaluation of studies of the Seashore Tests.—Certain features of these three investigations compel one to be doubtful as to their scientific accuracy. In these particular studies the reliability of the tests is taken for granted. But other investigators have found their reliability to be low or very moderate. Stanton, Brennan, and Schoen also consider the tests of high validity, this judgment being based on teachers' ratings of students. This seems a questionable procedure, when one considers the recognized fallibility of teachers' marks. Miss Brennan draws her evidence from only twenty cases, while Dr. Schoen has only ten cases. In all three studies the reader feels not only a lack of the critical attitude toward the tests being investigated, but also detects a positive "set" toward the tests and complete faith in their reliability and validity. In some cases too high value is placed on the rating of a single teacher.

Concerning the reliability of the Seashore Tests.—Several very careful and thorough studies of the reliability of these tests have been made with results sufficiently similar to make them highly significant. It is not possible to describe these studies in this report, but the results, in the form of the coefficients of reliability secured may be seen in Table I.

TABLE I

COEFFICIENTS OF RELIABILITY OF THE SEASHORE TESTS

Investigator	Pitch	Intensity	Time	Consonance	Memory	Rhythm
Ruch and Stoddard[5]	.70	.66	.53	.35	.66	.50
Brown[6]	.71	.65	.48	.43	.59	.29
Lanier[7]	.70	.57	.45	.51	.65	.36
Farnsworth[8]	.53 to .72	.44 and .56	.54 and .55	—	—	—
Highsmith[9]	.76	.50	.52	.52	.82	—

[2] Stanton, Hazel M. "Seashore Measures of Musical Talent," *Psychological Monographs*, XXXIX, No. 2, 1928.

[3] Brennan, Flora Mercer. "The Relationship between Musical Capacity and Performance," *Psychological Monographs*, XXXVI (1927), pp. 190-248.

[4] Schoen, Max. "The Validity of Tests of Musical Talent," *Journal of Comparative Psychology*, III (April, 1923), pp. 101-121.

[5] Ruch, G. M., and Stoddard, G. D. *Tests and Measurements in High School Instruction*. (Yonkers-on-Hudson, New York: World Book Company, 1927), 375 pp.

[6] Brown, Andrew W. "The Reliability and Validity of the Seashore Tests of Musical Talent," *Journal of Applied Psychology*, XII (October, 1928), pp. 468-476.

[7] Lanier, Lyle H. "Prediction of the Reliability of Mental Tests of Special Abilities," *Journal of Experimental Psychology*, X (1927), pp. 69-113.

[8] Farnsworth, Paul R. "The Spearman-Brown Prophecy Formula and the Seashore Tests," *Journal of Educational Psychology*, XIX (November, 1928), pp. 586-588.

[9] Highsmith, J. A. "Selecting Musical Talent," *Journal of Applied Psychology*, XIII, October, 1929.

It is noticeable that the highest of the coefficients show only a fair degree of reliability, and that all are below the standard of reliability usually attained by intelligence and educational tests.

Concerning the validity of the Seashore Tests.—The validity of these tests was studied by one investigator only, Brown, and the method of his study is open to criticism. He secured coefficients of validity varying from .11 to .17 with the exception of the test of tonal memory, which was .41. The coefficient of validity for the average of the tests was .35. It is noticeable that the test of tonal memory produced the highest coefficient of *reliability*, .82, and also the highest coefficient of *validity*, .41.

Seashore Tests used on the college level.—With this evidence regarding the Seashore tests before one, it is important to study the coefficients of correlation between these tests and the students' college marks in musical studies. These coefficients of correlation are available from two studies. Unfortunately, the studies are both concerned with girl students. But the subjects from the same college are not the same students. The investigations were made independently, several years apart, and for somewhat different purposes. A comparison of the results is recorded in Table II.

TABLE II

COEFFICIENTS OF CORRELATION WITH COLLEGE MARKS

	Highsmith—4 years		More—freshman year		
Test	Music Theory	Applied Music	Music Theory	Applied Music	Average of both
Pitch	.409	.18	.013 to .733	.017 to .458	.407
Intensity	.353	.333	—.077 to .245	—.137 to .147	.074
Time	.304	.246	.099 to .404	.028 to .293	.129
Consonance	.234	.04	.048 to .217	—.087 to .025	.009
Tonal Memory	.043	——	.277 to .505	—.154 to .462	.447
Rhythm	——	——	.10 to .432	.078 to .296	.223

Especially noticeable in this tabulation are the similarity of results of the tests on pitch and on consonance, and the dissimilarity in the results of the test of tonal memory. The tests on pitch and tonal memory, for which the writer secured the highest correlations, were found by two other investigators of college students to be the most valuable tests of the

Seashore battery. The study of Salisbury and Smith[10] in which these two tests are reported will be described later.

A study of the consonance test.—One of the most significant and most thorough studies reviewed by the present writer was Heinlein's "Experimental Study of the Seashore Consonance Test."[11] Heinlein's study was made "to ascertain the extent of influence which harmonic principles and the various laws of musical progression may have upon judgment in the paired interval comparison method employed by Seashore in the consonance test." His data seem to show that the basis of judgment in this test as given by Seashore is conflicting and unsatisfactory. He concludes that the nature and structure of the test material is such that one may expect negative results from the talented students. The data recorded in Table II seem to prove that Heinlein's point is well-taken.

The study by Salisbury and Smith.—This study was of especial interest because it was concerned with prognostic testing of students on the college level, although the goal sought was success in the study of sight-singing rather than success in general music study. It included all freshmen who expected to become teachers of primary or intermediate grades or in the rural schools. It thus involved a large number of subjects. Salisbury and Smith worked for three years on this investigation, and their final battery of three tests included two of the Seashore tests: pitch and tonal memory.

Summary of this review.—The foregoing brief summary of the results of these nine studies concerned with the Seashore Tests of Musical Ability reveals three outstanding facts concerning research in prognostic music testing, as follows:

1. Almost all the investigations having to do with prognostic testing in music have used the Seashore tests.

2. The majority of musicians and psychologists have, since their formation and promulgation, accepted these tests as highly accurate and useful, but there is a considerable amount of carefully gathered evidence in serious criticism of their reliability and their validity.

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[10] Salisbury, Frank S., and Smith, Harold B. "Prognosis of Sight Singing Ability of Normal School Students," *Journal of Applied Psychology*, XIII (October, 1929), pp. 425-429.

[11] Heinlein, Christian Paul. "An Experimental Study of the Seashore Consonance Test," *Journal of Experimental Psychology*, VIII (December, 1925), pp. 408-433.

3. Of the Seashore battery of six tests, those of pitch and of tonal memory seem to be the only ones promising for prognostic purposes, and these probably to a limited degree only.

The setting of the investigation.—This study was made at the North Carolina College for Women, in Greensboro, North Carolina, testing the freshmen who entered the School of Music in 1927, 1928, 1929, and 1930. This furnished a total of 200 students, but owing to incomplete data twenty-one students were dropped from the study, leaving a total of 179 students whose test scores and college marks furnished the data for the investigation.

A study by percentile ranks was made of the distribution of the intelligence scores of these students. The intelligence tests used were the McCall Multi-Mental test and the Ohio State Psychological Examination, Forms 14 and 16. This distribution of scores, compared with the distribution of scores of the entire freshman class of the college, showed that in these four years the School of Music received only about two-thirds of its quota of the dullest students, and one-third more than its quota of the brightest students. Hence, the students in this study were better than a random sample of the freshmen of this college.

On the other hand, an examination of the college marks earned by these students in music courses during their freshman year shows them to be an unselected group. The distribution of marks for theoretical music courses is rather close to a normal distribution, while the distribution of marks for applied music is considerably skewed toward the lower end. This may be explained, at least partially, by the fact that a considerable number of freshmen in the School of Music are so poorly prepared in piano when they enter college that it takes them three or four semesters to complete the work of the freshman piano course. Considering both the distribution of intelligence scores and of college marks in music courses, it is probably correct to consider this group of students a fair sample of the college freshmen in this college, and probably a fair representative of all women's colleges.

A large quiet room (the Recital Hall in the Music Building) where all the students taking the tests could be seated comfortably, and adequate equipment in the form of an excellent phonograph and a well-tuned piano, were available when needed. It was arranged to have certain hours during Freshman Week set aside for this testing, and also other hours, as needed, during the first few weeks of the college year

when all freshmen in the School of Music were expected to appear for the testing. Thus, conditions were kept almost uniform. All tests were administered by the investigator.

The marks in the musical subjects used were an average of the marks received during the freshman year in sight-singing and ear-training, in harmony, and in piano. All freshmen are required to take these subjects, except that sometimes a student studies violin instead of piano, in which case her marks in violin were used. The average mark obtained was the result of the judgment of three different teachers regarding the success of this student along three different lines of musical study, thus reducing, somewhat, the factor of inaccuracy in teachers' markings.

Tests used.—A total of fifteen group tests were used, eight of which were available on phonograph records: the six tests of the Seashore battery and two tests by Kwalwasser on melodic and harmonic sensitivity;[12] the Hutchinson Silent Reading test[13] was obtained from the publishers; and the Schoen test in Relative Pitch[14] was obtained from the *Journal of Comparative Psychology* for February, 1925.

The remaining five tests were devised by the investigator. Two of these were similar to sections of the Kwalwasser-Ruch test battery,[15] being concerned with the recognition of pitch errors and of time errors in the notation of familiar melodies. The remaining three tests, being quite unlike any tests before the public, are worthy of more complete description.

Aural and visual discrimination of pitch errors, and aural and visual discrimination of time errors.—The idea that prompted the formation of these two tests was the belief that the detection of errors in unfamiliar music heard while the student has before her the correct version of the music would require a considerable degree of coördination between the visual image and the aural acuity in pitch discrimination and in time discrimination. For each of these two tests, eight short

[12] Kwalwasser, Jacob. *Manual of Directions for Tests of Melodic and Harmonic Sensitivity.* Camden, New Jersey: Victor Talking Machine Company.

[13] Hutchinson, H. E. *Hutchinson Music Tests:* No. 1, Form A. Bloomington, Illinois: Public School Publishing Co.

[14] Schoen, Max. "Tests of Musical Feeling and Musical Understanding," *Journal of Comparative Psychology,* V (February, 1925), pp. 31-52.

[15] Kwalwasser, Jacob, and Ruch, G. M. *Kwalwasser-Ruch Test of Musical Accomplishment.* Iowa City, Iowa: Extension Division, University of Iowa.

melodies were constructed, each series increasing somewhat in difficulty from the first melody through the group of eight little tunes. The student was asked to make a check mark below any note that was not played as written. In the first of these tests pitch errors were made, that is, wrong tones were played by the person administering the tests; and, in the second test, time errors were made, that is, some tones were given the wrong time values. In each test, from three to eleven errors were to be found in each melody, the number varying from melody to melody so that the student could not feel or expect any regularity in the occurrence of errors. An effort was made to make the errors such that they would not be obvious, yet detectable with reasonable ease by the student with a high degree of discrimination and the ability to coördinate the aural response with the visual stimulus. For each test the score was the total number of notes in the eight melodies minus the number of notes incorrectly checked.

Discrimination of voice movement.—The material for this test consists of chord progressions of two chords each, each chord having three tones to produce the effect of three voices singing in harmony. An effort was made to use chord progressions that are pleasing and that are in common use in good music. In each pair of chords, the second chord is exactly like the first with the exception of one tone or voice. There is always one voice that moves by a step or a half-step. The problem of the student is to determine which of the three voices moves and the direction it takes. The test consists of twenty-five pairs of chords to be played on the piano, each pair to be played once, rather slowly, very distinctly, and the three tones always exactly simultaneous. The answer sheet was so arranged that the student needed only to make a check mark to indicate her answer, which was a choice of six possibilities. In scoring, it seemed fair to give some credit for naming the correct voice, even though the direction of the movement of that voice was incorrect. Hence, fifty was taken as a perfect score, that is, two points for each perfect answer, and one point if the correct voice was indicated with the incorrect direction of movement.

The Schoen Test on Relative Pitch.—Since the Schoen Test became a member of the final battery, it is worth while to know its exact nature. This test was constructed by Dr. Max Schoen of the Carnegie Institute of Technology, and is intended to measure the accuracy with which the

student can hear relative distances between tones. No reports of its success in this measurement were available, and it was placed in this investigation battery with much interest concerning the results it might show. The test consists of one hundred paired intervals, arranged in ten groups of ten pairs each. The test is given with the aid of the piano, the first pair of tones being played consecutively, and, after a short pause, the second pair of tones played consecutively. The student records her judgment of whether the difference in the pitch of the second pair of tones is smaller or greater than that between the tones of the first pair. After a few seconds in which the student records her judgment, the next two pairs of tones are played on the piano, and so on through the one hundred pairs.

Procedure.—As indicated earlier, the fifteen musical ability tests of various sorts and an intelligence test were given the students at the beginning of their freshman year. The marks earned in music courses during the freshman year were obtained from the college registrar's office. Corroborative data were also obtained in the form of college marks in music earned in the semesters later than the freshman year by thirty-six students, juniors and seniors, who were still in college.

The unreliability of all these data was fully realized, and they were used with this in mind. It is generally conceded that no single group intelligence test yields reliable individual results. The unreliability of teachers' marks is also well known. It is quite certain that there are variable errors present in the results of the various tests. These are inevitable because of conditions that cannot be controlled by the investigator, such as unfavorable physical or mental conditions in the case of certain students, lack of interest in the results of the test, prejudice against going through such a testing program, a lack of understanding of what to do when taking the test, and a sense of strangeness toward everything in the new surroundings. Other variable errors are introduced by the widely differing social, intellectual, and musical backgrounds of the various freshman students. The dissimilarity of their musical environment and training before entering college was especially noticeable.

The tests themselves are another source of variable errors, and, perhaps, in the case of some of the new tests, of constant errors, as well. No data regarding the reliability of these tests are available except in the case of the Seashore tests, and most investigators have reported their

reliability as relatively low. The five newly constructed tests have had their first and only use in this investigation. No study of their reliability or of their validity has been made. It may be that they do not measure what they are supposed to measure. Should this be true, in the case of any test, it is possible that the test measures an ability just as important as the one it was intended to measure, and perhaps as valuable from the prognostic standpoint; or it may measure a relatively unimportant ability, or one as well measured by another test.

With full realization of the unreliability of these data, both of college marks and of test scores, they were compared by means of correlations to determine their probable predictive value. Owing to the considerable difference between the distribution of the freshman marks in their theoretical music courses and in their applied music, it was thought wise to secure coefficients of correlation between each test and the freshman marks in theoretical music courses, and between each test and the freshman marks in applied music. This was to determine the type of music study with which the tests would correlate most satisfactorily.

Great irregularity was found in the results of this comparison, although in most cases the coefficient for theoretical music courses was larger than the coefficient for applied music, and sometimes very much larger. Hence, there seems to be a tendency toward more accurate prediction of probable success in theoretical music than in applied music. The averages of all the music courses studied during the freshman year were then correlated with the test scores, with the results recorded in Table III.

TABLE III

CORRELATIONS BETWEEN TESTS AND AVERAGE OF MUSIC MARKS
Number of Cases—179

Test	Coefficient	P.E.
Seashore:		
Sense of Pitch	.407	.04
Sense of Intensity	.074	.05
Sense of Time	.129	.04
Sense of Consonance	.009	.05
Sense of Rhythm	.223	.04
Tonal Memory	.447	.04
Moor:		
Pitch Errors	.483	.04
Time Errors	.449	.04
Pitch Discrimination (Aural and Visual)	.559	.03
Time Discrimination (Aural and Visual)	.563	.03
Voice Movement	.534	.03
Schoen—Relative Pitch	.547	.03
Kwalwasser—Melodic Sensitivity	.299	.05
Kwalwasser—Harmonic Sensitivity	.261	.05
Hutchinson—Silent Reading	.492	.04
Intelligence	.288	.05

The information found in this table is worth careful consideration. Of primary interest is the wide range of results, varying from .009 to .563, or from no correlation at all to a fair degree of correlation. The Seashore tests are seen to vary from .009 to .447. The three lowest coefficients in the entire table belong to three of the Seashore tests, the very lowest one, .009, belonging to the much criticized test of the Sense of Consonance. It is of outstanding interest to discover that among the highest correlations are the tests that endeavor to set problems of a general musical situation rather than to isolate and measure a single factor of musical ability. This will be discussed more fully in a later paragraph.

It will be noted that among the fifteen correlations there are nine that are above .40: Seashore, Sense of Pitch .407; Seashore, Tonal Memory .447; Hutchinson, Silent Sight Reading .492; More, Recognition of Pitch Errors .483; More, Recognition of Time Errors .449; More, Voice Movement .534; Schoen, Relative Pitch .547; More, Aural and Visual Discrimination of Pitch Errors .559; and More, Aural and Visual Discrimination of Time Errors .563. These nine tests were given further consideration in order to select the best small battery of four to six tests.

For this purpose a study was made of the corroborative data concerning the group of students who had been tested as freshmen and were still in college. It was felt that tests that produced as high correlations with these later college marks as they produced with the freshman marks should be valuable in the battery to be chosen. This information, however, proved of little help, for the coefficients thus secured were about the same as those for the freshman year, and more often a little lower than higher.

The choice of tests for the final battery was turned to those tests that yielded some of the highest correlations, that, at the same time, gave low or very moderate intercorrelations, and that also provided a variety of types of tests. The matter of low or moderate intercorrelations was important in order to avoid choosing two tests that measure the same ability. The tests of the chosen battery and their zero order correlations are as follows: Schoen, Relative Pitch .547; More, Voice Movement .534; More, Aural and Visual Discrimination of Pitch Errors .559; and More, Aural and Visual Discrimination of Time Errors .563.

The accuracy and value of this chosen battery was then more thoroughly studied through partial and multiple correlations. The co-

efficient of multiple correlation was .73 between college freshman marks in music courses and the four tests of the chosen battery. The relative weights of these tests are as follows: More, Aural and Visual Discrimination of Time Errors, .327; More, Aural and Visual Discrimination of Pitch Errors, .272; Schoen, Relative Pitch, .169; and More, Voice Movement, .129.

This procedure produced answers to the two questions propounded in the statement of the problem; a battery of four group tests was found, and this battery was shown to have a predictive value of .73. This coefficient must not be considered as highly predictive of the student's probable success in college music study, but as helpful information in estimating a prediction which will be about a third better than a chance prediction.

Conclusions.—The results of this study cannot be considered as final or incontrovertible. The unreliability of the data has been discussed; it is entirely possible that other tests, not known to the investigator, would have had higher predictive value than the tests that were used; and the coefficient of multiple correlation of .73 is not sufficient proof on which to base positive predictions.

There is another factor which limits the accuracy of these conclusions —the personal factor. That is, physical, mental, or emotional conditions, entirely unpredictable by the investigator, may so completely alter the quality of the student's work that the prediction based upon the results of this battery of tests will not be fulfilled in any respect. The conclusions stated above, however, may be considered as indicative of a very real relationship between the results of certain types of music tests and the student's future success in music study.

There remains another conclusion which grew in importance and clearness in the thought of the investigator as the study progressed. This is concerned with the type of test most promising in a prognostic battery. The present writer believes that this investigation has offered very strong evidence in support of the following conclusion: the tests that are most effective in predicting success in music study are those that present a general problem in music rather than those that attempt to measure any one factor of musical ability.

In his study, "The Reliability and Validity of the Seashore Tests of Musical Talent," A. W. Brown discussed the proposition that high scores in these tests, each attempting to measure an isolated factor of musical ability, may not really measure the musical ability of the indi-

vidual so well as a test that presents a problem combining several of these factors in a real musical situation. Brown cites the early efforts in intelligence testing and the unprofitable results of the attempts to measure isolated functions, such as memory, attention, reasoning, etc., and recalls Binet's success with tests that presented general problems. Brown then writes: "It may be that a test of general musical ability might prove more valuable than a series of tests of isolated factors."[16]

It is very noticeable that of the fifteen tests of musical ability used in this study, the highest coefficients of correlation were secured with those tests that were farthest from attempting to measure isolated factors and which presented more general musical problems.

The nature of musical ability.—A corollary of this conclusion just discussed is that musical ability is an exceedingly complex entity, probably one that is impossible of a definite analysis.

While this concept of musical ability and the best means of measuring that ability, as revealed in the results of this study, are contrary to our generally accepted ideas of musical capacity and of the methods of measuring that capacity, they are in accord with the newer concepts of psychology as expressed by the Gestalt school of psychologists. Most musicians and psychologists have accepted Seashore's analysis of the factors of musical capacity and his method of measuring these factors. Some investigators have raised questions regarding the value of the Seashore tests, but the basic idea of his analysis of musical talent has been unchallenged, so far as the writer is aware.

A challenge offered.—The writer wishes to challenge Seashore's ideas and tests, and directs the reader's attention to the results of this investigation in support of a concept of musical ability as a complex entity most effectively measured by tests presenting general musical problems.

A thoughtful evaluation of the results of this study reveals the great need of further investigation in three directions, as follows:

1. The four tests of the chosen battery, one of which has been little used and three of which have had no other use, need to be widely administered, in order that their value may be more thoroughly tested, and that they may be standardized, at least, tentatively.

2. Studies of the reliability and the validity of these tests are needed in order that the true value of data derived from them may be known.

[16] Brown, Andrew W. "The Reliability and Validity of the Seashore Tests of Musical Talent," *Journal of Applied Psychology*, XII (October, 1928), pp. 468-76.

3. The most outstanding need revealed by this study is the very great need of experimentation in the formulation of various sorts of tests of musical ability, tests based on the idea of the general problem in music. These tests should be widely administered and used in studies somewhat similar to the present one so as to determine the true worth of each test.

This opens a practically untouched field to the ambitious investigator interested in prognostic testing in music. The writer ventures to prophesy that the study of prognostic testing in music will reflect this conception of musical ability more and more strongly in the future. A tendency in that direction is already noticeable in the test battery by Kwalwasser and Dykema,[17] completed after the writer's investigation was well under way and therefore not used in that investigation; and in a still more recent study by Wilson,[18] at Ohio State University, also too recent to be used in this investigation. Wilson used the Seashore battery of tests and three tests which he devised, all of which set musical problems and one of which is fairly similar to the test on Aural and Visual Discrimination of Pitch Errors devised and used by the writer, and chosen as one of the four tests of her final battery. Wilson found this test, which he calls Score Reading, the most promising of all his tests. Administrators of music education on all levels are seeking something really helpful and thoroughly reliable on which they can base judgment of a student's potentialities and which will enable them to offer advice to the student. The writer is convinced that this must come from thorough and extensive study of tests of the general music problem type and offers this conclusion as the most valuable outcome of the investigation here reported.

[17] Kwalwasser, Jacob, and Dykema, Peter. *K-D Music Tests.* Camden, New Jersey: Victor Talking Machine Company.

[18] Wilson, M. Emmett. "The Prognostic Value for Music Success of Several Types of Tests," *Music Supervisors Journal,* (February, 1930), pp. 83-98; 100.

WORDS MISSPELLED MOST FREQUENTLY BY CHILDREN OF THE FOURTH, FIFTH, AND SIXTH GRADE LEVELS IN LIFE OUTSIDE THE SCHOOL

JAMES A. FITZGERALD
Loyola University, Chicago

INTRODUCTION

THREE thousand one hundred and eighty-four letters written by children of the fourth-, fifth-, and sixth-grade levels in life outside the school were collected from forty-one states in the United States by an indirect method.[1] The pupils of several hundred city and rural school systems of several states brought to their teachers the letters which they had received through the mail from friends and relatives in other places. Most of these letters were written in 1929 and 1930. Of these, 1243 were written by sixth-grade children, 1199 were written by fifth-grade children, and 742 were written by fourth-grade children. Nine hundred and fifteen letters were written by boys, and 2269 were written by girls; 2035 were written by children who attended town and city schools, and 1149 were written by children who attended rural schools. The frequency of error of each word was tabulated.[2]

PERCENTAGE OF SPELLING MISTAKES

The children of the three grades made 20,142 spelling errors in 460,906 running words of friendly letters, a percentage of error of 4.4. The sixth-grade children made 7012 mistakes in 205,028 attempted spellings, a percentage of error of 3.4; the fifth-grade children made 7112 mistakes in 168,188 attempts, a percentage of error of 4.2; and the fourth grade children made 6018 spelling mistakes in 87,690 attempted spellings, a percentage of error of 6.9.

Sixth-grade children misspelled 1871 of the 5575 words used, making mistakes on 33.5 percent of the different words attempted. Fifth-grade

[1] Fitzgerald, James A. *The Vocabulary, Spelling Errors, and Situations of Fourth, Fifth, and Sixth Grade Children's Letters Written in Life Outside the School.* Doctor's Thesis, Iowa City, Iowa: State University of Iowa, 1931.

It is recognized that children, when writing friendly letters, do not always give thought to correct spelling. Also if thought is given, they may change their expression so as to use a word they can spell in place of a "spelling demon." The implication from this study is, nevertheless, that more attention needs to be given to a real mastery, by repeated check studies in the grades four to six, of the one hundred words given in the list here printed.

[2] A frequency count of the vocabulary of children's letters was also made.

children misspelled 1820 of the 4705 words used, making mistakes on 38.7 of the different words attempted. Fourth-grade children misspelled 1553 of the 3327 words used, making mistakes on 46.7 percent of the different words attempted. The children of the three grades misspelled, once or more, 3266 of the 7340 words used, making mistakes on 44.4 percent of the different words attempted.

The sixth-grade children made 7012 mistakes on 1871 different words, an average of 3.75 for each word missed. The fifth-grade children made 7112 mistakes on 1820 different words, an average of 3.91 for each word missed. The fourth-grade children made 6018 spelling mistakes on 1553 different words, an average of 3.88 for each word missed. The children of the three grades made 20,142 spelling mistakes on 3266 different words, an average of 6.17 errors for each word missed.

SPELLING ERROR LISTS

Four spelling error lists of one hundred words each[3] were prepared, one for each grade and a composite list for the three grades. The words were ranked in the order of frequency of misspelling. The word "too," misspelled 550 times, was, according to these data, the most abused word; it held first place in the sixth-grade list, in the fifth-grade list, and in the composite list for the three grades; it was second in the fourth-grade list. The word "you," missed 312 times, was the second most frequently misspelled expression although it was seventeenth in the sixth-grade list and fifth in the fifth-grade list. Its position was such because of two factors: (1) its frequency of use (its spelling was attempted 12,810 times); and (2) its difficulty for the children of the fourth grade in writing and spelling; it was missed 193 times by them in 2597 attempts. (The fifth-grade children made 80 errors in 4703 attempts; the sixth-grade children made 39 errors in 5510 attempts to use it.) The word "received," used 624 times, was missed 309 times; it ranked second in difficulty in the sixth- and fifth-grade lists and 5.5 in the fourth-grade list. The reason for the comparatively low ranking in the latter grade was its infrequency of use at this level; the fourth-grade children, however, missed it in 63 percent of the attempted spellings, or 56 out of 89 trials. It was a real demon for all the grades.

Twenty of the words included in the composite list of words most frequently missed by children of the three grades were contractions and

[3] There are 102 words in the sixth-grade list. The four lists, because of overlapping, include only 148 words.

abbreviations. These were missed out of all proportion to the number of times the expressions were used; perhaps more stress should be placed upon them in the spelling work. Either they should be better taught or the low quality of many of them should be pointed out.

A comparison of the four error lists shows that 86 words are common to the composite and to the sixth-grade lists; that 88 words are common to the composite and to the fifth-grade lists; and that 77 words are common to the composite and to the fourth-grade lists.

Every word[4] in this composite list of most frequently missed words is found in both the common vocabulary of adults[5] and the basic vocabulary of high-school children.[6] Every word in the four lists with the exception of "ha-ha" is found in Dr. Horn's *Basic Writing Vocabulary*. Every word in the four lists except "arithmetic" is found in the high-school vocabulary compiled by Dr. Ashbaugh.

It is peculiar that a comparison of the one hundred demons of the Jones investigation[7] with the one hundred words of the composite list of this investigation shows but twenty words common to both lists.[8] Two of Jones's four arch demons, "which" and "separate," do not appear in this list. "Separate" was used ten times and missed three times in the letters of this study; "which" was used 224 times and missed 14 times in these letters. The words "received," "teacher's," "it's," and "to-day" which gave real trouble to the children who wrote the letters studied were not found in the Jones's list of demons. The great variance in the two lists may be partially explained by the fact that the data for the Jones's study were children's school themes, and the data of the present study were letters written spontaneously by children in life outside the school.

IMPLICATIONS

The large number of spelling errors (20,142) made by children in friendly letters written in life outside the school calls attention sharply

[4] Two forms "good-bye" and "good-by" are given in this list; but one form is listed in Horn's and Ashbaugh's studies.

[5] Horn, Ernest. *A Basic Writing Vocabulary*. University of Iowa Monographs in Education, No. 4, Iowa City, Iowa: University of Iowa, 1926.

[6] Ashbaugh, E. J. *Vocabulary of High School Pupils' Letters*. Unpublished, Iowa City, Iowa: University of Iowa.

[7] Jones, W. Franklin. *Concrete Investigation of the Material of English Spelling*. Vermilion, South Dakota: University of South Dakota, 1914.

[8] The words marked (J) in the composite list are found in Jones's *One Hundred Spelling Demons*.

LISTS OF ONE HUNDRED WORDS MOST FREQUENTLY MISSPELLED BY CHILDREN OF THE SIXTH, FIFTH, AND FOURTH GRADES, AND OF THE THREE GRADES (THE COMPOSITE LIST)

Word	*Sixth* Frequency of Error	*Fifth* Frequency of Error	*Fourth* Frequency of Error	*Composite* Frequency of Error	Rank[a]
too (J)	214	196	140	550	1
you	39	80	193	312	2
received	109	144	56	309	3
teacher's	105	114	76	295	4
don't (J)	81	91	53	225	5
it's	106	51	26	183	6
write (J)	53	72	56	181	7
friend (J)	54	62	54	170	8
to-day	76	40	46	162	9
haven't	80	46	28	154	10
I'm	61	44	43	148	11
your	30	45	69	144	12
our	31	62	42	135	13
know (J)	29	56	40	125	14
good-by	32	49	42	123	15
didn't	57	35	25	117	16
good-bye	49	40	24	113	17
suppose	37	48	26	111	18
Feb.	34	44	31	109	19
writing (J)	38	46	24	108	20
there (J)	45	37	20	102	21
am	17	35	46	98	22.5
Mrs.	41	38	19	98	22.5
that's	46	26	24	96	24
getting	27	28	40	95	25
their (J)	38	38	18	94	26
guess (J)	25	37	28	90	27
because	31	33	25	89	28.5
two (J)	18	29	42	89	28.5
have	31	29	28	88	30
to-night (J)	32	29	25	86	31.5
Jan.	27	24	35	86	31.5
now	22	39	24	85	33
I'll	31	32	21	84	34
all right	33	25	23	81	35
cousin	18	33	27	78	36.5
from	15	23	40	78	36.5
won't (J)	32	26	18	76	38
Saturday	21	24	30	75	39
Oct.	26	10	38	74	40.5
stationery	29	31	14	74	40.5
here (J)	25	34	14	73	42
and	18	24	28	70	43
sometime	28	29	12	69	44.5
sure (J)	27	32	10	69	44.5
everybody	27	23	18	68	46
schoolhouse	24	22	21	67	47.5
to	20	34	13	67	47.5
o'clock	40	14	9	63	49
quite	30	26	6	62	50
Sunday	22	23	16	61	51
coming (J)	23	21	15	59	52
Halloween	20	15	23	58	53.5
isn't	30	15	13	58	53.5
school	10	12	34	56	55
well	12	18	25	55	57
for	16	10	29	55	57
letter	15	12	28	55	57
Dec.	21	14	19	54	59.5
pretty	22	27	5	54	59.5
we	17	14	22	53	61.5
will	3	26	24	53	61.5
we're	26	15	10	51	64

[a] The words of the composite list are ranked in order of the frequency of error.

anything	25	19	7	51	64
Mr.	19	17	15	51	64
sincerely	10	31	9	50	67.5
fourth	5	10	35	50	67.5
Nov.	22	9	19	50	67.5
going	15	18	17	50	67.5
down	16	11	22	49	71.5
hello	20	17	12	49	71.5
right	18	19	12	49	71.5
think	13	20	16	49	71.5
Thanksgiving	13	20	15	48	74.5
to-morrow	18	17	13	48	74.5
through (J)	17	13	17	47	77.5
thought	13	20	14	47	77.5
already	18	8	21	47	77.5
awhile	26	14	7	47	77.5
Friday	22	14	10	46	80.5
sometimes	17	13	16	46	80.5
name	8	18	19	45	83
they're	18	21	6	45	83
can't (J)	16	13	16	45	83
hear (J)	11	21	12	44	86
very (J)	14	20	10	44	86
afternoon	24	10	10	44	86
daddy	13	20	9	42	88
cannot	7	19	15	41	89
birthday	10	23	7	40	92
close	14	11	15	40	92
her	18	10	12	40	92
some (J)	6	15	19	40	92
them	10	16	14	40	92
something	12	16	11	39	95.5
want	14	10	15	39	95.5
address	16	13	9	38	98.5
are	14	13	11	38	98.5
Mar.	4	24	10	38	98.5
teacher	8	14	16	38	98.5

ADDITIONAL WORDS NOT IN THE COMPOSITE LIST OF ONE HUNDRED MOST FREQUENTLY MISSED WORDS BUT IN THE SIXTH, FIFTH, AND FOURTH GRADE LISTS

	Sixth Frequency of Error	*Fifth* Frequency of Error	*Fourth* Frequency of Error
I've	22		
nowadays	21		
surely	20		
off	18		
there's	18		
couldn't	17		
maybe	17		
until	17		
you're	17	14	
together	16		
receive	15		
outside	15		
how's	15		
remember	14		
went	14		
before	13		
hospital		23	
studying		22	
friends		17	
yours		17	
about		16	
arithmetic		16	
would		14	
time		14	13
quit		14	
truly		14	14
anyway		13	
Miss			20

how	19
along	19
weather	17
I	17
answer	16
soon	16
my	16
ha-ha	15
summer	15
handkerchiefs	14
morning	14
been	13
come	13
Christmas	13
every	13
fine	13
grade	13
just	13
was	13
they	13

to the deficiency of transfer of spelling skill from school lessons to natural writing. Although the percentage of errors decreased from approximately seven percent in fourth grade to 3.4 percent in sixth-grade letters, the sixth-grade children made more mistakes in the letters of this study than the fourth-grade children, principally because they wrote more letters. That 44.4 percent of the 7340 different words used in friendly letters were misspelled once or more by children of the three grade levels is appalling when the limitation of the vocabulary and the ease of spelling of the words missed are taken into consideration.

Since nearly all of the 148 words contained in the difficulty lists for the three grades are found with high frequencies in the Horn and Ashbaugh lists and in the vocabulary lists of this investigation, it seems reasonable that these words be made the object of special study for these grades. Mastery of the one hundred words of greatest difficulty for each grade should eliminate approximately half of the spelling mistakes in child letter writing on these levels since 9375 of the 20,142 spelling errors (47 percent) listed were made on the 148 words of these difficulty lists.

EDITORIALS

THE INTEGRATION OF SCIENTIFIC TECHNIQUES IN EDUCATIONAL RESEARCH

It is the purpose of this editorial to stress the need for the integration of scientific techniques in educational research. The three techniques to which special attention will be given are: (1) measurement which has its background in the science of physics; (2) the methodology of research which has its background in logic; and (3) statistics which has its background in mathematics. One finds among researchers in the field of education individuals who are fairly well informed about statistics and the mathematical background of statistics, for example, but who know very little about, or who have very little appreciation for, the controlled techniques of the experimentalist. So too, one finds statisticians who apply highly refined statistical techniques to data collected by means of subjective, unreliable, and frequently invalid data-gathering devices; and then, there are experimentalists who employ very simple, elementary, and naïve statistical procedures. It is the point of this editorial that research in the field of education would profit by a more integrated application of these basic techniques to the scientific study of education.

The writer should like to illustrate this point from a recent so-called statistical study of the measurement of teaching ability.[1] It was the purpose of this investigation to study the validity of certain more or less commonly employed measures of teaching ability in terms of three criteria: (1) a composite of measures of pupil achievement; (2) a composite of tests or qualities commonly associated with teaching ability; and (3) a composite of teacher rating scales. While the data were collected with more than ordinary care, the presence of uncontrolled factors, such as, for example, the mental age, the emotional characteristics and health of the subjects, the curriculum, the methods of instruction, the habits of study, the materials of instruction, the physical environment, etc., made the results difficult, if not impossible, to interpret. The in-

[1] Barr, A. S., and others. "The Measurement of Teaching Ability." Unpublished material.

vestigation is of the kind ordinarily referred to as a correlation study. The investigators desired to determine the relationship between gain in pupil achievement as measured by the Stanford Achievement Test and teaching ability as measured by a number of such tests and rating scales as, the Knight Test of Teaching Aptitude, the American Council Psychological Examination, the Morris Trait Index L, the Pennsylvania Teacher Score Card, the Torgerson Diagnostic Teacher Rating Scale, etc. While the investigators desired to express in somewhat final terms the relationship between these several measures, they felt quite certain that the coefficients of correlation could not be taken at face value. The point was made in an earlier editorial[2] that the size of the coefficient of correlation is dependent upon the characteristics of the data or the population from which they were drawn. The changes in pupil achievement from the beginning to the end of the school year, for example, were all statistically significant; as most everyone knows, however, these changes may be due to intelligent self-effort, mental maturing, practice, and many other constant and fluctuating factors extraneous to the teaching act. Should the factor of mental maturing be more potent than the teaching act in producing changes in pupils as measured by the Stanford Achievement Test it would then appear that tests with high coefficients of correlation were measures of the mental growth of the pupils and not of teaching ability. While more refined statistical procedures may be employed to overcome certain inadequacies in the original data it would appear that these constitute only a poor substitute for the control of factors. The difficulty here referred to is more or less generally characteristic of most so-called statistical investigations, the results of which might be greatly improved by the employment of controlled observation in the collection of data.

A point has been made of the fact that statistical investigations might be greatly improved were controlled techniques more generally employed in the collection of data. The reverse appears equally true: most researches can be improved by the use of better statistics. While the crude methods of percentages, averages, and estimates have given way to more refined statistical methods, the methods in general use, even at the present time, are relatively elementary. Without going into detail, there are many statistical procedures such as the Lexis ratio; bi-serial r; the correction for attenuation, grouping, and the spread of talent; the test

[2] Barr, A. S. "The Coefficient of Correlation," (Editorial) *Journal of Educational Research*, XXIII (January, 1931), pp. 55-60.

for linearity, goodness of fit, and the statistical significance of the difference when the groups are paired groups or when they are correlated; the sigma of a percentage difference as employed in test construction, etc., that warrant more general use. Probably one of the greatest problems just at present, however, is the rather frequent misapplication and misinterpretation of statistical formulae already in use, due to the lack of understanding of the assumptions underlying each, and the restrictions placed upon their application. From this point of view, educational research should improve with the development of better statistics.

Without attempting to illustrate the point further, the general situation may be summarized as follows: (1) All research does or should involve *a purpose or problem*. This may be: a) to describe; b) to predict outcomes; c) to trace growth; d) to determine causes or relationships; etc. (2) All research does or should involve a *hypothesis* or hypotheses suggested by someone other than the investigator or projected by one's own experiences, controlled and uncontrolled, or the experiences of others as observed or reported verbally. (3) All research does or should involve *a more or less logical method of thinking* out of which the plan of the investigation takes shape. The means of control, the measuring devices, and the statistics are merely the thinker's tools. (4) All research does or should involve *data-gathering devices:* tests, rating scales, questionnaires, mechanical devices, interviews, observational techniques, etc. The science of education is dependent in a very real way upon the science of measurement. (5) All research does or should involve the *statistical analysis, classification and summarization of data;* this may be simple, elementary and naïve or complex, advanced and statistically sophisticated. Quantitative methods may be applied to all sorts of data, ranging from that collected by means of subjective, unreliable, and invalid data-gathering devices without controls to that collected by means of carefully validated instruments of measurement with controls. There is no statistical method of research, per se. And (6) all research does or should involve *conclusions, inferences, and generalizations.* We are concerned here merely with the fact that all research involves measurement, logical thinking, and statistics, and that educational research can be improved through the integration of these techniques in the scientific study of education.

A. S. Barr

REVIEWS

Address all communications relative to book reviews to Editor E. J. Ashbaugh, Miami University, Oxford, Ohio.

SCHUTTE, T. H. *Orientation in Education.* New York: Macmillan Company, 1932. ix + 521 pp.

This is a book designed to provide guidance for students already within, or about to enter training in, the field of education. It contains a score or more of articles prepared by as many different writers, each discussing a particular phase of educational work. In the main, the writers endeavor to survey their respective fields as to scope, opportunities, and desirable training. Some of the fields treated are administration, supervision, testing and measurement, elementary, secondary, and higher education, extra-curricular activities, guidance, character education, surveys, finance, and research. Two opening chapters outline the European background and the development of education in America. It is a needed contribution and a valuable addition to our present wealth of more or less similar but scattered material. Its perusal gives one a certain inspiration and satisfaction as it recalls to our minds the progress the profession has made within the century, and as it gives perspective and body to the work in which we are engaged.

As a textbook, how and where is it to be used? The editor answers this question in the last paragraph of his preface. In brief summary the following covers his proposals: (1) a basic text for introductory courses to the field of education as a whole; (2) a library reference book providing introductions in the various chapters to specialized educational courses; (3) a comprehensive survey for non-professional, culturally interested students; (4) a textbook introduction to education for high school, normal school, and college or university teacher-training classes; and (5) a book for the non-professional reader interested in education. With numbers 2, 3, and 5 the reviewer is in full accord, but with numbers 1 and 4 he cannot agree. He does not feel that the teacher-in-training whether in high school, normal school (incidentally one wonders if the editor is really cognizant of what has happened to normal schools within the last dozen years), or university school of education would be in any sense ready for a course based upon such a book as this. Lack of space in this review prevents more than a dogmatic assertion to the effect that an introductory course for the students in the groups just cited should be an introduction to classroom teaching as the heart of all educational work, and that classroom teaching is the avenue through which workers should enter specialized fields. We already have too many educators (with the emphasis on the last syllable) who, without adequate training and experience in classroom teaching, organize, administer, supervise, survey, and otherwise control the whole educational program. The reviewer heartily endorses the book for library reference purposes and for general non-professional reading, but he does not feel that the book is

fitted for use as a text in introduction to education or teaching. In case of a reprint one or two of the articles might be more carefully edited. E. C. HIGBIE

Wilson Teachers College, Washington, D. C.

OVERN, ALFRED VICTOR. *Indices of Supply and Demand of Teachers in Minnesota.* Published by University of Minnesota Press, 1932. xxv + 253 pp.

ANDERSON, EARL W., AND FOSTER, RICHARD R. *Teacher Supply and Demand in Ohio, 1929-30.* A monograph published by Ohio Education Association and Bureau of Educational Research, 1932. 170 pp.

These two books present the latest and most comprehensive study of teacher supply and demand that has come to my attention during the last year. Dr. Overn analyzed both the potential and kinetic demand for teachers in Minnesota during the period 1920-1930. Since Buckingham made a study of teacher supply and demand in Ohio for 1923-1924 and Myers for 1926-1927, Anderson and Foster confined themselves to the one year 1929-1930 and its relation to the teachers graduated in the previous year.

Both studies bring vividly to the attention of the reader certain facts. First, that in the elementary field the supply of teachers with two years or more of training exceeds the demand but does not equal the need. In other words, communities and employment boards have not yet differentiated in their employment between teachers who have had two or more years of specific training for elementary teaching and those who have met some lesser standard, still admissible under state law.

Second, in the high school field both studies point out how our present system of employment and school administration makes it practically certain that a large proportion of beginning teachers must attempt to teach subjects for which they have had little or no preparation. The combination of subjects to which they are assigned is so extensive and so varied that training institutions and prospective teachers can by no possible means anticipate the requirements which the employment board will place upon the new teacher.

Third, the ratio between the supply and demand for teachers trained in specific fields varies widely with the over supply greatest in foreign languages, English and Social Science, and least in vocational fields.

Both volumes present valuable data to the educational leaders of respective states and in the country as a whole. If education is to make progress toward true professional status, some limitation of the number trained and better guidance in the fields in which the training takes place must be worked out in the very near future. E. J. ASHBAUGH

Miami University

HISSONG, CLYDE. *The Activity Movement.* Baltimore: Warwick and York, 1932. 122 pp.

Interest in modern educational theories has long held a prominent place but the mention of a new book dealing with the progressive aspects of education is to guarantee at once an interested audience. The progressive movement or the activity movement which is the term the author uses, is attracting much attention not because of its novelty but because the movement has now gathered sufficient momentum to become an important factor in the social and economic reconstruction of our present civilization. It must either be

understood and utilized to the best advantage or misunderstood and abolished.

The author has made a distinct contribution to the field in giving clearly the historical development of the activity movement as found in interpreting the theories of Rosseau. Chapter II entitled—"Rosseau and Individual Freedom" gives one a clear exposition of the place of the individual, in relation to his needed education. The fact is clearly brought out—(1) "that the child's spontaneous and natural activities are essential ingredients in his education and (2) that the child in the course of his growth passes through distinct stages of development, each calling for procedures appropriate to its characteristics, and each essential for the succeeding stage." (p. 31) This in itself is a challenge to the newer schools that are eager for help in reorganizing their curricula.

Chapter III—"Freedom and the Culture Epoch Theory" traces the influence of such thinkers as Herbart, Pestalozzi, Ziller, Hall and Ferriere. After a critical analysis of their writings the author quotes from Dewey who offers the following conclusions: "It is the physical and social conditions that are the determining factors in the interaction of child and environment instead of racial epochs, and for this reason the teacher must draw his aims and materials for instruction largely from the life that surrounds the child." (p. 46)

In Chapter IV—"A New Emphasis Upon the Individual" a real contribution is made for those individuals who accept unthinkingly and, therefore, uncritically the teachings of great educators without thought or reference to their application to present day needs. Valuable as the S-R bond theory has been in the past to reduce all learning to such a mechanistic level is to advocate a policy, which the more recent contributions in the field of biology and psychology seem to invalidate.

Chapter VI—"The Unitary Point of View" and Chapter VII—"Conditions for maximum growth" continue with understanding and interpretation of the role of the individual.

The bibliography at the end of each chapter is extremely valuable because highly selective, the quotations are pointed and unusually helpful. Weakness is displayed when the author tries to criticize activity schools and assumes falsely that they are all alike. This is undoubtedly due to the fact that information was secured entirely from printed materials rather than from actual experience. Any student of the activity movement is fully aware that some schools are better than others and some are poorer. One of the contributions of activity school movement has been the variety of school experience offered to attain the same end. The great number of quotations while excellently selected indicates that the author is more dependent upon others for ideas than upon a point of view of his own which develops when one is in close contact with an activity school or at least has enough experience with one not to make the sweeping generalizations which occur. (p. 111)

The book is interesting and well written, gives the reader an excellent compilation of quotations which are valuable but does not convince the reviewer that the author has had sufficient experience and understanding of the activity schools which exist to write with the necessary penetration, which gives one the right to be critically analytical.

RUTH STREITZ
University of Cincinnati

KENNEDY-FRASER, DAVID. *Education of the Backward Child.* New York: D. Appleton and Company, 1932. 230 pp.

This book is written in simple non-technical language so it may be useful to untrained persons interested in this field. It is written in systematic order and points are well illustrated.

A supervisor or school psychologist would find especially interesting the discussion of individual differences and the distinction made between children who are permanently and temporarily retarded. The portion of the book treating school reorganization is also worth consideration.

For the teacher as well as the supervisor, the author deals with the problem of organizing a class within itself so the teaching may better fit the children. This subject is particularly well treated in this book.

The bulk of the book is concerned with the subjects taught in the special rooms, how they are taught, and how they may be motivated in some instances. The chapter on pre-primary work is very good because it offers definite suggestions as to types of work fitted to young and backward children as well as the reason for their importance at the particular stage of development. Oral language is emphasized as an important part of a child's development. Handwork is given due emphasis but no definite help for the teacher is offered as in other subjects. Reading, writing, arithmetic, spelling and composition are each considered. The inexperienced teacher should profit by reading this material.

The author's treatment of older backward, and even feeble-minded children of high grade, is particularly good. He emphasizes the importance of practical training and a gradual break between school and industry.

The Mongolian children are treated as separate from the general group. As a last word, the teacher is given a few general pointers as to what she must expect to do and yet receive little credit.

As a whole, this book is one of the best brief discussions of the problem of educating retarded children published recently. In many respects, it reflects the English point of view.

HELEN L. MANSFIELD

ADAMS, JESSE, AND TAYLOR, WILLIAM S. *An Introduction to Education and the Teaching Process.* New York: Macmillan Company, 1932. x + 668.

In this addition to the rapidly increasing number of volumes to guide the novice in education, "The authors have . . . endeavored to write a book for the beginning course in education which will:

"1. Be convincing in its philosophical soundness."

Four additional desires and two distinct purposes, namely, to aid persons interested to determine whether or not they shall really wish to become teachers, and to aid teachers in service to improve themselves professionally, are enumerated in the preface. For the advantage of the beginner the authors have placed practical considerations first and reserved the more intangible philosophic discussions for the concluding portion of the book. One might argue that sound practice cannot be built without first laying the philosophic foundation, but there is here neither time nor energy for a comprehensive discussion of the authors' plan of attack and stated purposes. Rather, it is more in order to accept the purposes unquestioningly and attempt to discover

with what success they have been achieved.

The entire treatment can scarcely be called "convincing in its philosophical soundness." The psychology of the learning process as presented is Thorndikian and the philosophy which determines "the meaning of education" is "in terms of the growth idea." The authors find support for "the growth idea" in the teachings of Dewey, Kilpatrick, and Bode, the latter an avowed critic of Thorndikian psychology. It seems hardly feasible, therefore, to find unity in a position which combines the psychology of Thorndike and the philosophy of Bode.

In an attempt to achieve their first purpose Adams and Taylor open their discussion with a chapter on "Teaching as a Life Work." After reading the ten reasons listed for choosing teaching as a permanent occupation many of the interested will unquestionably turn elsewhere for employment. One dislikes the implication of the statement, "*A short working day and relatively long vacations usually accompany the teaching profession.*" The greater challenge would seem to lie in a full time profession that requires continued research when scheduled hours are over.

The consideration of the teaching process in the second part of the book seems to fulfill the desire to give "concrete suggestions concerning the work of the teacher." A succinct view of varying practices presented in the survey of management problems, school administration, equipment, finance, supervision, and recent developments in education should prove "interesting, stimulating, and helpful" to teachers in service. The last section, however, and particularly the last chapter which purports to develop the fundamental question in the philosophy of education, "The Meaning of Education," must leave the novice with a sense of bewilderment and helplessness. After reading a survey of practice among administrators, teachers, and school boards in the solution of pressing school problems the reader has a right to expect that at the end he will be provided a means of measuring these practices. Instead of that he finds, in the final chapter, that he must wrestle with an unannotated summary of twenty-four views concerning the meaning of education and attempt, through these bare summaries, to evaluate his own conclusions both in the field of philosophy and practice. The uninitiated in educational theory and practice will enjoy reading this discussion of education and the teaching process, and students of education approaching the book in an antagonistic mood will find it an unusually stimulating source for enhancing their initial attitude.

CLYDE HISSONG
Bowling Green State College,
Bowling Green, Ohio

RUEDIGER, WILLIAM CARL. *Teaching Procedures.* Boston: Houghton Mifflin Company, 1932. xv + 472 pp.

Professor Ruediger writes with a rich background of study and experience. It is thirty years since he began to teach courses in education. His *Principles of Education* appeared in 1910. The breadth of his reading and study is indicated by the chronological distribution of the bibliography he gives in his recent volume, *Teaching Procedures.* In this bibliography of one hundred fifty-six titles, seventeen bear dates prior to 1900, twenty-one titles fall within the period from 1900 to 1910 and an additional forty-one within the following decade.

This personal equipment of Professor Ruediger suggests the merits and weaknesses of his most recent production. The book is a somewhat confusing and annoying mixture of concepts and theories. The "direct attack" on teaching, which is designated as the "dominating note of the book" was suggested by a type of instruction in foreign languages. For his orientation in the analysis of objectives the author acknowledges indebtedness to the late Professor M. V. O'Shea under whom he served as an assistant during the year 1902-03. The objectives of teaching which are distinguished from the objectives of education have their source in Bagley's *Educational Values* (1911). The consideration of methodology begins with an exposition of the Herbartian five formal steps in a slightly modified form. Deductive learning is treated in Chapter IV. The learning unit as proposed by Morrison is advocated in Chapter XV. In the intervening chapters we find such topics as "The Logical and Psychological Aspects of Method," "Developing Appreciation," "Social-Moral Education," and "Teaching Motor Control." Activity programs and the accompanying methodology are discussed in Chapter XVIII; but in Chapter XX lesson planning of the more formal and traditional type is suggested.

The book is theoretical rather than practical in the sense that much more space is given to an exposition of theories of learning and teaching as conceived by the author than to descriptions of instructional techniques and illustrations of teaching. On the whole the "practical" sections of the book are better than the ones devoted to "theory." Professor Ruediger's long experience and wide reading has made him a competent critic of educational practices and usually his advice relative to instructional procedures is sound. The last two chapters, "Tests and Examinations," and "Marks and Marking," are especially commendable in this respect.

In the opinion of the reviewer *Teaching Procedures* will not prove to be a satisfactory text for a first course in methods of teaching. For an advanced course, at least on a graduate level, it should be a stimulating text, especially under an instructor who has an adequate perspective in the field of educational theory.

WALTER S. MONROE
University of Illinois

WEST, JOHN C., DOMINICK, L. H., AND ARNESON, A. L. *A Handbook for Boards of Education.* Published by the authors, Grand Forks, North Dakota, 1932.

The authors have not attempted a treatise on the duties and practices of boards of education. They have been content with stating briefly and in convenient form some of the fundamental principles and approved practices of public school organization and administration from the standpoint of the board member. This little handbook, which can easily be carried in the coat pocket, should prove valuable to many school board members, especially those who are inexperienced or unfamiliar with modern theory and practice underlying educational administration.

Among other important principles and practices given endorsement are: small boards of education elected at large on a non-partisan basis; the committee-of-the-whole procedure in the conduct of the school affairs; a chief executive officer in the person of the superintendent of schools; the selection of the superintendent of schools; policy determination; and checking the efficiency of administra-

tion by frequent reports as the chief functions of the board of education. Opposition is voiced to standing committees of the board of education, active participation in the details of administration and supervision by the school board or its members, and to party or selfish considerations in the conduct of the school business. There is a distinct tone of discouragement toward the employment of home teachers or married women teachers, especially in the smaller communities. Many other matters, such as the type of bonds to be issued and the type of salary schedule to be adopted, are mentioned without indicating which is generally considered as superior.

One who reads this little book may feel that more attention might well have been given to the policy-determining function of the school board the results of which are to be found in a comprehensive and clearly stated set of rules and regulations. There is some danger that the inexperienced and untrained school board member may feel that the authors attempt to confine his duties largely to that of a rubber stamp, although it is clear to a trained and experienced administrator that the authors had no intention of conveying such a point of view. One may also feel that sufficient emphasis has not been placed upon the fact that members of school boards as individuals have no powers or duties beyond those of any qualified elector except when sitting as a board or in the performance of a task directly delegated by the board.

This publication, which can be read in a few minutes, should prove valuable in giving school board members the right point of view toward their duties and responsibilities and how they may best be discharged. The fact that no dogmatic answers are given to many of the issues raised should create a desire for additional information and lead to further reading and study. If it does this, the authors will probably feel well repaid for the efforts.

GARTH H. AKRIDGE
Columbia University

HOLY, T. C. *Cleveland Teachers' Salaries.* Published by Cleveland Teachers Federation and Bureau of Educational Research, 1932. 192 pp.

The Cleveland Teachers Federation and the Cleveland Board of Education jointly authorized a study of the salary situation for that city. A comprehensive study of the ability and training of teachers, their salaries compared with salaries of other professions, advantages and disadvantages of teaching income and living costs, are set forth in clear cut fashion. Likewise, the financial ability to support the schools, public revenue and the allocation of public revenues portray Cleveland's ability to pay its teachers. The monograph closes with forty-eight major conclusions, sixteen recommendations, and a bibliography. Any community interested in making a careful study of their teacher salary situation will find this monograph most helpful.

CAIRNS, GEORGE JOSEPH. *An Analytical Study of Mathematical Abilities.* Published in Washington, D. C., 1931. 104 pp.

The author recognized two conflicting views regarding the nature of mathematical ability. One, that there is a special capacity or faculty underlying mathematical ability distinct from and with no essentially close connection with other forms of mental capacity; the other, that mathematical ability is the complex resultant of a number of loosely connected capacities. By means of a series of 18 tests with a group of 130

boys, the author attempted an extensive analytical study of the abilities involved. He closes his discussion with the hypothesis "that mathematical ability is nothing more than the general g factor being applied to different specific numerical and spatial tasks, the s factors; and that group factors are just overlapping identical or similar elements in the specific factors."

The author worked with Professor Spearman and it will be noted that he has expressed the hypothesis in terms of Spearman's theory. He also utilized Spearman's tetrad differences but devised an additional method which he calls the "reference value method." This method analyses the specific correlations remaining after the general factor has been taken out by forming tetrads of them with two pools of valid reference tests. The study is of particular interest to mathematicians and offers suggestion of method for similar studies in other fields.

WILCOX, ROTHWELL. *Private Secondary Education in the Association of Colleges and Secondary Schools of the Southern States.* John Hopkins University Studies in Education, No. 19, 1932. 151 pp.

By means of a careful analysis of the reports from the private secondary schools to the Association of Colleges and Secondary Schools of the Southern States and a private questionnaire, the significant facts regarding a major portion of these schools was secured. A visitation to outstanding private schools gave the information necessary for the evaluation of the reports and questionnaires received. The essential problems of health, efficiency of instruction, vocational guidance, citizenship, leisure, and character objectives are all handled in a significant way. The final conclusions are set forth in 77 statements which reveal, in a concise manner, most of the points about which persons interested in private schools desire information.

WOODY, CLIFFORD. *New Problems in Elementary School Instruction.* Public School Publishing Company, 1932.

This is an extension of a previous work book in the elementary field. The author states that it is designed so that it may be used with almost any textbook on the psychology of the elementary school subjects. It is intended to give practice in analysis of problems and the withholding of final judgment until full information can be secured from reference material. The general fields of language, reading, spelling and arithmetic are covered.

RESEARCH ABSTRACTS and BIBLIOGRAPHIES

Address all communications relative to research abstracts and bibliographies to Editor A. S. Barr, University of Wisconsin, Madison, Wisconsin.

BULLETINS

Abstracts of Masters' and Doctors' Theses in Education, Educational Research Bulletin, No. 4, University of Minnesota, Minneapolis, Minnesota, 71 pp.

Contains abstracts of seven doctors' theses and some fifty masters' theses.

L'organisation de L'instruction Publique dans 53 Pays (The Organization of Public Instruction in 53 Countries), Bureau of International Education, Geneva, 1932. 370 pp.

This bulletin furnishes a clear and concise description of the organization of public instruction in 53 countries, including the United States, Germany, Canada, France, Spain, etc.

EXPERIMENTAL EDUCATION AND SUPERVISION

CHRISTENSEN, ALFRED. "The Student Body in Public Junior Colleges," *Junior College Journal*, III (October, 1932), pp. 13-16.

The author concludes from a survey of the sex distribution and the curricular distribution for students in 73 representative junior colleges that the curricular distribution does not seem to correspond with future needs of the students, and that when the curriculum becomes better adjusted one may expect approximately the same proportions of the sexes as now shown throughout the country in the high schools.

COURTIS, S. A. "The Measurement of the Efficiency of Teaching," *Educational Administration and Supervision*, XVIII (September, 1932), pp. 401-412.

The author explains a method of measuring efficiency based upon growth curves expressed in isochron units.

EXPERIMENTAL STUDIES OF LEARNING AND TEACHING

BRUCE, G. V. "An Attempt to Vitalize Chemistry Teaching in the High School Through a Modified Form of the Unit-Assignment Technique," *Science Education*, XVI (October, 1932), pp. 392-403.

From an experimental study of the daily assignment and the unit assignment in chemistry, the author concludes that the daily assignment is most effective for those parts of chemistry that call for factual memory, but that unit assignments are superior for those parts that involve practical application and an appreciation of chemistry in its relation to industry and the home and life.

BUNCH, MARION E., AND MCTEER, FRANCES DAVIS. "The Influence of Punishment During Learning upon Retroactive Inhibition," *Journal of Experimental Psychology*, XV (October, 1932), pp. 473-495.

Administering punishment for errors during the mastery of a stylus maze resulted in decidedly quicker learning by all criteria; the detrimental effect of the

second maze upon the retention of the first was less than one-half as great, except in terms of trials, when original learning occurred under punishment as when it occurred under normal non-punishment conditions.

CASON, HULSEY. "The Pleasure-Pain Theory of Learning," *Psychological Review*, XXXIX (September, 1932), pp. 440-466.

The author presents a survey of the Spencer-Bain-Baldwin theory of learning; experimental data on the pleasure-pain theory of learning; and Thorndike's law of effect, and reaches the conclusion that the experimental and observational results from both men and animals are opposed to the pleasure-pain theory of learning.

CRABB, A. L., AND OTHERS. "Bibliography of Studies Dealing Wholly or in Part with the Training School," *Peabody Journal of Education*, X (September, 1932), pp. 98-114.

A bibliography of studies relating to the training school.

DVORAK, AUGUST, AND ENGLISH, ELSIE. "The Efficiency of Remedial Teaching," *Educational Administration and Supervision*, XVIII (September, 1932), pp. 466-471.

From an experimental study of remedial teaching, the author finds in every subject except spelling that the average growth in attainment during one semester exceeded the regular growth by .64 school years.

EGAN, EULA PEARL. *The Effect of Fore-Exercises on Test Reliability*. Bulletin No. 98, (Nashville, Tennessee: George Peabody College for Teachers, 1932), pp. 36.

From three experimental studies of the effect of fore-exercises on test reliability, the author concludes that the reliability coefficient of the three test study in this investigation were not significantly higher when fore-exercises were used.

JACOBSON, EDMUND. "Electrophysiology of Mental Activities," *American Journal of Psychology*, XLIV (October, 1932), pp. 677-694.

A method of measuring neuromuscular processes in mental activities is presented, and the possibility of the development of a branch of study analogous with physical chemistry, which may appropriately be called physical psychology is described.

MCGEOCH, JOHN A. "The Influence of Degree of Interpolated Learning upon Retroactive Inhibition," *American Journal of Psychology*, XLIV (October, 1932), pp. 695-708.

The author shows the presence of retroactive inhibition and that it corresponds, roughly, to the degree of interpolated learning.

PATERSON, DONALD G., AND TINKER, MILES A. "Studies of Typographical Factors Influencing Speed of Reading: VIII. Space Between Lines or Leading," *Journal of Applied Psychology*, XVI (August, 1932), pp. 388-397.

From an experimental study of solid, one point, two point, and four point leading, the author concludes that materials printed with two point leading is read 7.5 faster than materials set solid.

STROUD, J. B. "Effect of Complexity of Material upon the Form of Learning

Curves," *American Journal of Psychology*, XLIV (October, 1932), pp. 721-731.

The results of the experiments indicate that the form of learning curves is materially affected by the size or complexity of the unit of response; as the complexity of material of given length is increased the learning curves will change from negative toward positive acceleration; the intermediate curves will be s-shaped; as the complexity of material is increased the inflection points on the intermediate s-shaped curves will rise, approaching the vanishing point.

STUIT, DEWEY B., AND ENGELHART, MAX D. "A Critical Summary of the Research on the Lecture-Demonstration Versus the Individual-Laboratory Method of Teaching High-School Chemistry," *Science Education*, XVI (October, 1932), pp. 380-391.

From a survey of previous investigations, the author concludes that the evidence is conflicting and that the problem is yet unsolved.

PUPIL WELFARE, GUIDANCE, AND DEVELOPMENT

BOAZ, FRANZ. "Studies in Growth," *Human Biology*, IV (September, 1932), pp. 307-350.

The author presents a statistical analysis of 160 Hebrew and 236 non-Hebrew children from the Horace Mann School and 185 children from the Hebrew orphan asylum. The age of first menstruation of Hebrew and non-Hebrew girls in Horace Mann School, New York, is for both 13.1 — 1.2 years. The author finds that the growth curve is intimately related to the moment of maximum rate of growth and less so to the date of first menstruation.

LAYTON, WARREN KENNETH. "The Problem of Pubescence in Junior High School Boys," *School Review*, XL (October, 1932), pp. 595-605.

From a study of pubescence made in the Foch Intermediate School, Detroit, Michigan, with the assistance of a group of twenty coöperative teachers, the author concludes that poorer adjustment is found in the attendance, conduct, attention, application, and emotional behavior of the matured and the maturing boy.

THRASHER, FREDERIC M., AND OTHERS. "Boys' Club Study," *Journal of Educational Sociology*, VI (September, 1932), pp. 1-63.

Contains articles by Whitley, Nelson, Sollins, and Braunstein, relating to various phases of the boys' club work.

CURRICULUM RESEARCH

HUNTER, GEORGE W., AND KNAPP, ROY. "Science Objectives at the Junior- and Senior-High-School Level," *Science Education*, XVI (October, 1932), pp. 407-416.

A questionnaire study of the objectives of junior and senior high-school science based upon 393 returns from every state in the Union, with the exception of West Virginia.

PRESSEY, L. C., AND ELAM, M. K. "The Fundamental Vocabulary of Elementary-School Arithmetic," *Elementary School Journal*, XXXIII (September, 1932), pp. 46-50.

From a study of the frequency of words in four previous investigations, from a rating of 100 elementary-school teachers for importance, and from a study of the social usefulness of these words, the authors present a fundamental vocabulary for elementary-school arithmetic.

RODGERS, GRACE S. "A Critical Study of the Grammatical Errors of Junior High School Pupils," *Journal of Applied Psychology*, XVI (August, 1932), pp. 421-426.

From an analysis of 29,000 compositions written by junior high-school students, the author finds 9394 errors, 7,784 of which occurred among only 24 types of error.

TERRY, PAUL W. "Summary of Investigations of Extra-Curriculum Activities in 1931. II," *School Review*, XL (October, 1932), pp. 613-619.

The second of two articles summarizing investigations relating to extra-curricular activities.

MEASUREMENTS, STATISTICS, AND SCIENTIFIC TECHNIQUES

CARROLL, HERBERT A. "A Standardized Test of Prose Appreciation for Senior High School Pupils," *Journal of Educational Psychology*, XXIII (September, 1932), pp. 401-410.

The writer presents statistical data relative to the validity, reliability, and distribution of scores for a test of prose appreciation.

EZEKIEL, MORDECAI. " 'Students' Method for Measuring the Significance of a Difference Between Matched Groups," *Journal of Educational Psychology*, XXIII (September, 1932), pp. 446-450.

A description of "students' " methods for measuring the significance of a difference between matched groups. This formulae which has been known for many years but not well known, gives a very much smaller probable error than that computed by the usual formula.

HOLZINGER, KARL J. "The Reliability of a Single Test Item," *Journal of Educational Psychology*, XXIII (September, 1932), pp. 411-417.

The author gives formulae for the standard error of response for a single test item. The response errors of series of items is already known.

HORST, PAUL. "A General Method for Evaluating Multiple Regression Constants," *Journal of the American Statistical Association*, XXVII (September, 1932), pp. 270-278.

The author describes a method which enables one to calculate values from which all the standard multiple regression constants may be easily derived by simple algebra.

IRWIN, J. O. "Recent Advances in Mathematical Statistics (1931)," *Journal of the Royal Statistical Society*, XCV (1932), pp. 498-530.

The author presents a survey of the literature on mathematical statistics for the year 1931.

TRYON, R. C. "So-called Group Factors as Determiners of Abilities," *Psychological Review*, XXXIX (September, 1932), pp. 403-439.

From a careful analysis of ten experimental researches, in which correlations between abilities have been accurately determined, the author finds no evidence to indicate that the tetrad differences criterion of the two factor theory of Spearman's was satisfied.

VERNON, H. M., AND WARNER, C. G. "Objective and Subjective Tests for Noise," *Personnel Journal*, XI (October, 1932), pp. 141-149.

The authors found that very loud noises, if fairly uniform, had compara-

tively little effect, especially when an arithmetic test was being worked; but intermittent noises caused a good deal of disturbance, especially to the reading of a volume on psychology.

MISCELLANEOUS

CARROLL, HERBERT A. "A Preliminary Report on a Study of the Relationship between Ability in Art and Certain Personality Traits," *School and Society*, XXXVI (August, 1932), pp. 285-288.

Data gathered on several hundred college students at the University of Minnesota consistently indicated that there is no significant relationship between ability in art and introversion, submissiveness or emotional instability.

GOETH, GERTRUDE. "Beziehungen zwiechen intellektueller und künstlerisch-technischer Begabung an einem Mädchenlyzeum," (The Relation Between General Intelligence and Artistic and Practical-Arts Aptitudes in a Girls' Lyceum) *Zeitschrift für Pädagogische Psychologie: Experimentelle Pädagogik und jugenkundliche Forschung;* 33 Jahr. Nr. 6; (Juni, 1932), pp. 199-211.

An investigation of the relationship between general intelligence, language, mathematics, social information (Kulturkunde), music, drawing, and practical arts (Werktätigkeit). 238 subjects. Conclusions: Relatively high correlations between general intelligence and academic skills and between academic skills individually, and between drawing and the practical arts. A certain level of intelligence is essential for conspicuous aptitude in music and drawing.

SANGREN, PAUL V., AND WILSON, MARY C. *Instructional Tests in Reading.* Bloomington, Illinois: Public School Publishing Company, 1932.

A series of instructional tests in reading for grades 1 to 4, including tests of word recognition, phrase recognition, understanding sentences, following directions, and association of rhymes or sentences with illustrations. Forms A and B.

TOUTON, FRANK C. "Theses Written in California Universities in Candidacy for Graduate Degrees in Education During the Academic Year 1931-1932," *California Quarterly*, VIII (October, 1932), pp. 94.

An annual list of theses written in California universities in candidacy for graduate degrees in education, published annually in the October issue of the *California Quarterly*.

RESEARCH NEWS and COMMUNICATIONS

Address all research news and communications to Editor Carter V. Good, Teachers College, University of Cincinnati, Cincinnati, Ohio.

Yearbooks for 1933 and 1934.—The Thirty-Second Yearbook of the National Society for the Study of Education will be issued about February 1, 1933. Its approximately seven hundred pages will be taken up entirely with the report of the Society's "Committee on the Teaching of Geography." This Committee is composed of A. E. Parkins (George Peabody College), Chairman; Robert M. Brown (Rhode Island College of Education); E. E. Lackey (University of Nebraska); Edith Parker (University of Chicago); Douglas Ridgley (Clark University); DeForest Stull (Columbia University); and Zoe Thralls (University of Pittsburgh). The Committee has enlisted numerous associates and has conducted extended conferences, so that the forthcoming yearbook may safely be taken as representing the consensus of those personally concerned with the teaching of geography in the United States on such matters as its place in the curriculum, and its content and methods of presentation at all levels from the elementary school through the college. The volume also includes interesting introductory matter upon old geography texts, a discussion of the training of teachers, and a selected group of contributions showing what is going on in the field of research in connection with the teaching of geography.

The Society plans to issue in 1934 a yearbook in two parts, one devoted to "The Activity Curriculum" and one to "School Buildings and Equipment."

Research Projects in California.—The Carnegie Foundation for the Advancement of Teaching is conducting a survey of education beyond high school in California, under the direction of Henry Suzzallo. The primary objects of the survey are to answer certain questions relative to the integration of higher education, the development of the junior colleges of the state, and the need for regional four-year colleges of the liberal arts and technical types in the several parts of the state. The survey is well under way. Data are collected in California by Paul Webb acting as the agent for the investigation, and are forwarded to the office of the Foundation in New York. A Commission of seven outstanding educators will review the data and make the recommendations which constitute the survey report.

Current economic conditions in California, as well as in other states, and the state system of school finance which requires local real and personal property to bear nearly 85 percent of the total cost of the public schools, have resulted in bringing together representatives of the several state-wide organizations representing owners of real estate and farm property, of the State Department of Education, and of the California Teachers' Association, in an endeavor to develop a plan for refinancing public education in California. A tentative plan has been agreed upon which will require a constitutional amendment to

transfer to the state all of the current county costs for the support of elementary and high schools. This constitutional amendment will necessarily be followed by legislation putting into effect an equalization plan for the distribution of the increased amount of the state's contribution to the public schools. Responsibility for the development of this plan and for its application to the several school districts of the state, nearly 3600 in number, naturally will devolve upon the State Department of Education. It is hoped that such a plan will involve the application of the principles developed by Ivan R. Waterman, now Chief of the State Department Division of Textbooks and Publications, in his "Equalization of the Burden of Support for Education," published by the University of California Press as Volume 6, No. 5, of the University's publications in education.

The need for adequate factual data upon the basis of which to make requests of the Legislature for the support of the state teachers colleges, of which there are seven in California, has resulted in the assignment of Andrew P. Hill, Jr., Chief of the Division of Schoolhouse Planning of the State Department of Education, as coördinating officer for the state teachers colleges. He is directing investigations relative to current operation and building financial needs as well as curricular offerings and salary schedules in the teachers colleges. This new function of the State Department should result in a more scientific method of determining the needs of teachers colleges.

Research in Ohio.—A mimeographed booklet of thirty-two pages, issued by the Research Department of the Ohio Education Association and edited by Josephine MacLatchy of Ohio State University, includes a list of the research activities carried on by the members of the Department during the year preceding June, 1932. The items are classified in terms of studies completed, investigations in progress, publications, and topics.

Curriculum and Testing Work in Minneapolis.—The philosophy of curriculum construction and revision which has developed in Minneapolis may be summarized in six working principles which describe the procedure employed.

1. Curriculum construction in any field of subject matter should be based upon a survey of the needs in that field.

Standardized tests are valuable in determining points where help is needed, where materials need revising, and where current methods of instruction should be studied. Pupil-failures indicate points of difficulty in school work. Reports of teachers, principals, and supervisors indicate places in the curriculum where revision or correction should be made. Special survey techniques are often employed to determine weaknesses and strengths of particular courses. Life outside of school indicates accepted values which must be incorporated into courses of study, as well as certain items which society agrees are no longer vital and therefore must be eliminated.

2. Curriculum construction must proceed with the coöperative understanding and suggestions of the principals and teachers who are to use the course. A small group of teachers or principals is selected to serve as a "production committee." All teachers give advice and furnish suggestions from their classroom experience. Principals and teachers try out new courses of study; and a group of principals, the general curriculum committee, reads and criticizes each new

course before it is submitted to the board of education for adoption. The curriculum department not only aids in production but also assumes responsibility in analyzing scientific studies, in conducting surveys of pupils' needs, in canvassing community needs, in consulting other teachers and departments of the school, in interviewing experts, and in conducting studies related to the course.

3. Curriculum construction must be closely articulated with a program of teacher training. Where curriculum revision calls for a change or modification in teaching procedures and in materials, as it usually does, it is advisable to incorporate into the curriculum-construction program a teacher-training program, in order that all teachers may participate directly or indirectly in constructing the new course. The term teacher training is used here in the broadest meaning. It implies an understanding of the philosophy underlying the proposed changes, the acquisition of subject matter, and the study of the literature of pertinent research, as well as the development of skill in the proposed teaching techniques. It includes not only the training of classroom teachers, but also the development of understanding on the part of supervisory officers. In a city where supervisory responsibilities are largely vested in school principals, they must be acquainted with the techniques of supervising the new course. Thus, a training program must include supervisors as well as teachers. The activities of the teacher-training program and the steps necessary for curriculum revision are so articulated that the course of study, when it finally appears, is the product of group-wide participation, group-wide in the sense that the major responsibility of initiating and devising has been carried by a relatively small curriculum committee, but all teachers have given definite assistance. Thus, all interested persons are acquainted with the new course before it appears in print. The activities and experiences which are necessary to the development of an adequate course of study are almost as supervisory in character as they are curricular.

4. Each program of curricular construction should utilize the best studies in the field of research and the advice of educational experts in the field which is being studied. When a program is initiated, those in general charge canvass educational literature and select the best researches to present to the curriculum group and, in many cases, to the entire teaching group. Frequently it is possible, through the courtesy of the several teachers' organizations, to bring experts to the city for consultation in the field which is being studied.

5. After a course is written, provision should be made for testing its suitability and effectiveness. This is done by collecting teachers' criticisms and suggestions, or by devising special curriculum tests. Curriculum tests and standardized tests give a definite check upon courses of study, so far as learning important skills and facts is concerned. They do not measure all the desirable outcomes of education, but they do measure some important ones in an impartial manner. Teachers' suggestions and criticisms must be relied upon to estimate some of the more subjective values of a new course, such as attitudes, ideals, and habits of work.

6. Curriculum revision is constant. No course of study ever reaches a stage of perfection where further work is not needed. In a dynamic world it is impossible to perfect organization and ac-

complishment. Hence, when a course of study is completed, a small group of interested persons begins work on testing, examining, experimenting, and searching the studies of others for ways of improving the course.

In the Minneapolis public schools, the curriculum department (two full-time workers), under direction of the superintendent and his assistants, coöperates with principals and teachers in carrying forward the curricular and supervisory activities just described.

In Minneapolis, testing programs are conducted three times each year, the first taking place about two weeks after the opening of school, the second, at the end of the first semester in January, and the last during the first part of June at the end of the second semester. The results are reported to the principals and teachers in test bulletins. The achievement of individual pupils, of classes, and of schools, when compared with national and city standards, gives teachers and supervisors definite information in terms of which instruction may be planned. Thus, the needs of a class are not a matter of guess-work. Minneapolis school administrators and supervisors have used tests as aids in giving each child a balanced program of instruction. Teachers have used them in diagnosing individual needs within the group, and as a basis for providing adequate remedial measures.

Oakland Studies.—Recent bulletins of the Oakland, California, Department of Research, deal with results secured from administering mental tests and achievement tests at various levels of the school system, a follow-up report on high-school graduates, holding power of the schools, and a report on the professional study of teachers and principals. C. C. Grover, assistant director of research, comments on the testing work in the paragraphs which follow.

Each semester the Kuhlmann-Anderson Intelligence Test and the Stanford Reading Test are given to all the members of the high sixth-grade class who are to be promoted to the junior high schools. The results of these tests are used by the junior high school principals and counselors as a basis for the classification of the entering low seventh-grade pupils. This material, together with other information furnished by the elementary schools, makes it possible to assign these 2000 to 2500 pupils to sections, rooms, and classes without haste or confusion *before the semester opens* and enables the junior high schools to begin productive classroom work immediately upon the opening of school. While this is the primary purpose for which the tests are given, they also provide a survey of the intelligence and reading achievement of the pupils in the last half year of their elementary school life. The intelligence test gives an estimate of the ability of the pupils to do the work of the public schools and is reported in terms of mental ages. The reading test measures accurately and reliably how well pupils read and is reported in terms of reading ages.

The data secured in 1931 show the average mental age to be twelve years and no months and the average reading age to be twelve years and five months. This is an unusually good showing, since satisfactory school progress is assumed to have been made when the two averages are equal, and in the case of this class the excess of reading age over mental age is a full semester of school work.

The data indicate a compact chronological age distribution which also is worthy of note as a very excellent index

of the administrative efficiency of the elementary-school principals. In contrast to the chronological age distribution there is a wide range in the mental age which, as stated above, is a measure of the ability of the pupils in this class to do school work, and a still wider range in the reading age, which shows the achievement of the class in a single school subject. Such facts give some idea of the complexity of the teaching problem. The mere placing of eleven and twelve year old pupils in a grade does not furnish answers to the many pressing questions of teaching procedure. The more information the school is able to assemble about each pupil, the greater are the possibilities of variation in his educational treatment.

New Journal.—The first number of the *Journal of Experimental Education* appeared in September. It will be published quarterly by Edwards Brothers of Ann Arbor, Michigan. The editorial board is composed by A. S. Barr (Wisconsin), chairman, W. S. Monroe (Illinois), G. D. Stoddard (Iowa), Henry Harap (Western Reserve), and Carter V. Good (Cincinnati). The new journal provides an avenue of publication for articles more technical than those which the editors of the *Journal of Educational Research* expect to publish in the future in meeting primarily the needs and interests of field workers.

College Testing Program.—The report of the Advisory Committee on College Testing of the American Council on Education dealing with its nation-wide college sophomore testing program of 1932 reveals some startling variations, not only among colleges but within them. In the opinion of the Advisory Committee these variations indicate a situation which college administrators may well study with interest. The 140 participating colleges in thirty-eight states represent every type of collegiate institution found in the country. In so far as the test results are valid, the report offers provisional answers to such questions as the following:

In what type of institution are the sophomores most superior or most inferior in intelligence, English, general science, and general culture?

What degree groups are most superior or most inferior on each of these tests?

What is the relation between chronological age and achievement on the tests and between test scores and college marks?

What is the relation between tested intelligence and English achievement of private secondary school sophomores and college sophomores?

The chairman of the committee is J. B. Johnston of the University of Minnesota.

Attainment Examinations.—The University of Wisconsin has employed attainment examinations in foreign languages during the past year in French, German, Spanish, and Latin. Of the 663 students who have presented themselves 447 were successful and 216 were not, the ratio of the former to the latter being two to one.

A careful study of the data reveals that 285 students saved about 325 semesters or nearly 1000 credits of study. If the data were fully utilized by the students, it would mean a saving in instruction of nearly $7000. Of course this economy is partly offset by those who continue the subject or fail.

When this plan, however, is fully extended to the fields of English, history, mathematics, biology, chemistry, and physics, as provided for in the new cur-

riculum, there will be operating in the university a motivating pedagogical principle joined with economy of time and operating expense of primary importance.

Readings in the Social Studies.—An experiment in social instruction has been launched by the American Council on Education. Under the series title "Achievements of Civilization" a number of short, attractive reading units have been published which are designed to supply pupils with accounts of the way in which social evolution has produced such institutions as the alphabet, number, weights and measures, the calendar, and governmental regulations. Each unit is a single brochure of thirty-two or sixty-four pages, fully illustrated and written in a style which will appeal to pupils in the upper grades and the high school. The titles of the first three numbers of the series are "The Story of Writing," "The Story of Numbers," and "The Story of Weights and Measures." The brochures can be secured at a nominal cost by addressing the Committee on Materials of Instruction of the American Council on Education, 5835 Kimbark Avenue, Chicago, Illinois.

New Library on Student Life.—In 1920 the University of Göttingen created the first, and thus far the only, position in the new field of "Hochschulkunde" (cultural history of universities, especially the life of student bodies) and appointed Dr. Ssymank as its first incumbent. In connection therewith a new scientific library was established. This library will collect, in accordance with a definite plan, and classify for scientific study, all literature on the subject of university history and student life. The nucleus for this new library is the already large and important collection which Dr. Ssymank has been gathering during the past thirty years. At first it consisted only of books on the history of German universities and German student life. Later a foreign division was added which has enjoyed considerable growth. It is this latter division, however, which most needs to be enlarged and systematically developed. To this end Professor Ssymank desires to establish connections with all universities and institutions of higher learning in other countries, in order to receive whatever publications they issue in book or periodical form which concern their history and the history of their student bodies. In similar manner and for the same purpose he desires the coöperation of all national student groups. At present the library contains some 10,000 books or pamphlets, and receives regularly more than 150 periodicals, but, as stated above, these deal for the greater part with countries of German speech. All persons, universities, and student organizations desiring to coöperate in this important undertaking should communicate directly with Professor Paul Ssymank, University of Göttingen, 2 Jennerstrasse, Göttingen, Germany.